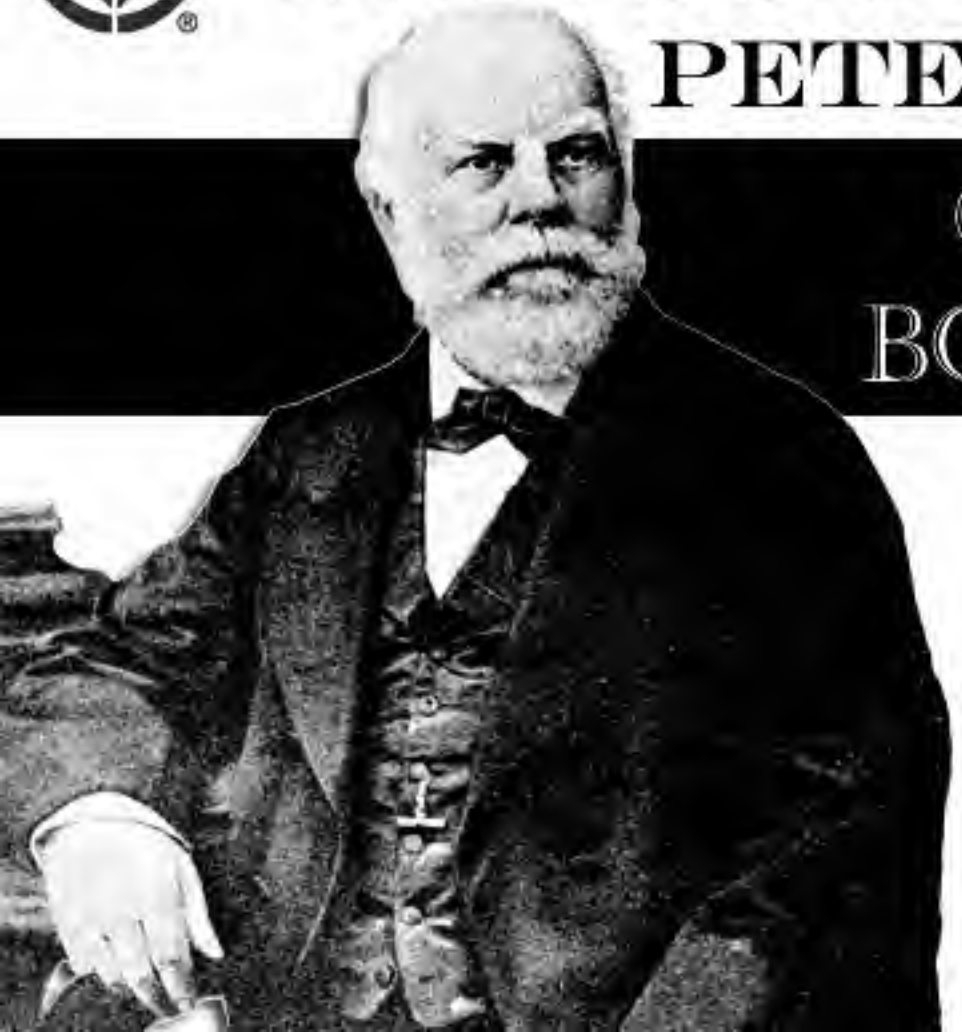
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George Engelmann Botanical Notebooks

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elongated and climbing, from large fusiform perennial roots; leaves cordate, palmately 5–7-lobed or angled; tendrils 2–5-cleft; flowers small, white. Flowering in early spring. — Watson, Proc. Am. Acad. xi. 138.

A genus confined to the Pacific Coast, the species not well known, nearly allied to the *Echinocystis* of the Atlantic States, to which it has been referred, but from which it is separated by its thick perennial roots, its large turgid immarginate seeds, and its thick fleshy cotyledons, which remain under ground in germination. The fruit in some species appears to be wholly indehiscent.

1. **M. Californica,** Torr. Nearly glabrous, with short scattered curved hairs: stem 20 to 30 feet long: leaves 2 to 6 inches broad, with a deep closed sinus, more or less deeply 5–7-lobed, but rarely to the middle; lobes broad-triangular, abruptly acute, mucronate, the sinuses obtuse: sterile flowers (5 to 20) in slender racemes 3 to 5 inches long, somewhat pubescent, on slender pedicels a line or two long; corolla 3 or 4 lines broad: fertile flowers 5 or 6 lines broad, without abortive stamens: ovary globose, densely echinate, 2- (rarely 3–4)-celled, the cells 1–2-ovuled; lower ovule ascending, the upper horizontal, attached to the outer side of the cell: fruit globose or ovoid, 2 inches long, densely covered with stout almost pungent spines ($\frac{1}{2}$ to 1 inch long), 1–4-seeded: seed obovoid, 10 lines long, 6 in diameter, surrounded by a shallow groove or darker line, the hilum at the narrow base. — Pacif. R. Rep. vi. 74. *Echinocystis fabacea,* Naudin, Ann. Sci. Nat. 4 ser. xii. 154, t. 9, and xvi. 188.

Near the coast from San Diego to Punta de los Reyes. A specimen from Knight's Ferry on the Stanislaus (*Bigelow*) has the ripe fruit much less strongly armed. Specimens from Cocomungo (*Bigelow*) may also belong here, though having the leaves more deeply divided with narrower lobes, and the 4-celled fruit with 4 or 5 seeds in each cell.

2. **M. Marah,** Watson, l. c. Scabrous or nearly smooth: stems 10 to 30 feet long: leaves cordate or reniform, 3 to 6 inches broad, lobed nearly as in the last: sterile flowers a half to an inch broad, in simple or panicled loosely flowered racemes, 4 to 12 inches long; pedicels slender, 2 to 6 lines long: fertile flowers with abortive stamens: ovary oblong-ovate, more or less covered with soft spines, 2–3-celled; ovules 1 to 4 or more in each cell, ascending or horizontal, attached to the outer side of the cell; fruit ovate-oblong, 4 inches long, somewhat attenuate at each end, more or less muricate all over with weak spines: seeds horizontally imposed, flattish, suborbicular or irregularly elliptical, an inch in diameter, about half as thick, with an obscure marginal furrow and prominent lateral hilum. — *Marah muricatus,* Kellogg, Proc. Calif. Acad. i. 38.

Common around and near San Francisco Bay. Catalina Island (*Baker*), but sterile flowers only.

3. **M. Oregona,** Torr. Much resembling the last: fertile flowers without abortive stamens: young fruit similar in shape, sparingly muricate with soft spines, 3–4-celled, the cells imbricated above each other, 1-seeded: mature fruit (so far as known) an inch or two long, unarmed, with very thin walls: seeds as in the last, or somewhat smaller (8 to 11 lines broad), attached to the outer side of the cell. — Pacif. R. Rep. vi. 74.

Common in Washington Territory and said to range from Puget Sound to Klamath Lake.

4. **M. muricata,** Watson, l. c. Nearly glabrous or somewhat scabrous, often more or less glaucous: stems 6 to 8 feet long: leaves 2 to 4 inches broad, orbicular-cordate with a nearly closed sinus or broadly reniform, deeply 5-lobed, the divisions all broader above and sharply sinuate-toothed or -lobed: sterile racemes slender, often very few-flowered: fertile flowers 3 to 4 lines broad, without abortive stamens, on slender pedicels an inch or two long: ovary smooth or sparingly muricate, oblong, acute at each end: fruit nearly globose, an inch in diameter, naked or with a few short weak spines near the base, 2-celled, 2-seeded: seed nearly globose, half an inch in diameter, ascending, attached to the outer side of the cell near the base, the margin smooth. — *Echinocystis muricata,* Kellogg, Proc. Calif. Acad. i. 57.

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Angels Camp, Calaveras County (*Rich, Bigelow*) ; near Placerville, *Kellogg, Bolander.* Specimens collected by Fremont, Hulse, and others, in the same region (from the Mokelumne River to the Upper Sacramento), may belong here though with the ovary 3- or 4-celled, and in some other minor respects different.

5. **M. Guadalupensis,** Watson, l. c. Nearly glabrous, the inflorescence somewhat pubescent : leaves thin, 3 to 8 inches broad, 3–5-lobed to the middle, the lower lobes quadrangular, the upper acuminate, with few short teeth : racemes nearly simple, 4 to 6 inches long : calyx-teeth filiform : corolla 6 to 8 lines broad : fertile flowers without abortive stamens : ovary on a slender pedicel an inch long, ovoid, densely covered with short soft spines, 2-celled ; ovules 1 or 2 in each cell, ascending : fruit ovoid, $1\frac{1}{2}$ to 2 inches long, acute above, somewhat pubescent and with short scattered stiff spines, usually 2-seeded : seeds subglobose, an inch in diameter, attached to the inner side of the cell, the margin smooth.

Guadalupe Island, on high rocks near the centre of the island, *Palmer*, 1875.

Order XLII. DATISCACEÆ.

A very small and peculiar order, chiefly represented by the following genus of only two species.

DATISCA, Linn.

Flowers dicœcious, sometimes perfect. Calyx of sterile flowers very short, with 4 to 9 unequal lobes : stamens 10 to 25 ; filaments short : rudimentary ovary none. Pistillate flowers with calyx-tube ovoid, somewhat 3-angled, 3-toothed : stamens three, when present, alternate with the teeth : styles 3, bifid, opposite the teeth, the linear lobes stigmatic on the inner side. Capsule oblong, coriaceous, 1-celled, opening at the apex between the styles. Seeds very numerous and small, in two to several rows upon the 3 parietal placentæ : embryo cylindrical, in the axis of small albumen.—Smooth stout perennial herbs; leaves unequally pinnatifid, with coarsely toothed lanceolate segments, the upper scarcely lobed ; flowers axillary, fascicled, nearly sessile.

Only two species known, one native of W. Asia, the other of California.

1. **D. glomerata,** Benth. & Hook. Erect, 2 or 3 feet high or more, branching : leaves ovate to lanceolate in outline, acuminate, 6 inches long, the numerous floral ones shorter and more narrowly lanceolate : flowers 4 to 7 in each axil of the elongated leafy raceme, the fertile mostly perfect : anthers nearly sessile, 2 lines long : styles longer than the ovary : capsule oblong-ovate, 3 or 4 lines long, slightly narrowed toward the truncate triangular 3-toothed summit. — Gen. Pl. i. 845. *Tricerastes glomerata,* Presl, Rel. Hænk. ii. 88, t. 64 ; Lindl. Veg. Kingd. 316, fig.

On stream-banks from Napa County to San Bernardino, and in the foot-hills of the Sierra Nevada from Amador to Tuolumne County.

Order XLIII. CACTACEÆ. By Dr. George Engelmann.

Green fleshy and thickened persistent mostly leafless plants, of peculiar aspect : globular or columnar, tuberculated or ribbed, or jointed and often flattened, usually armed with bundles of spines from the "*areolæ*," which constitute the axils of the (mostly absent) leaves. Flowers with numerous sepals, petals, and stamens, usually

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in many series, the cohering bases of all of which coat the inferior 1-celled many-ovuled ovary, and above it form a tube or cup, nectariferous at base. Style 1, with several or numerous stigmas. Fruit a pulpy or rarely dry 1-celled berry, with numerous campylotropous seeds (without or with some albumen) on several parietal placentæ.

An order of few genera, comprising a large number of species, peculiar to the warmer parts of America, and confined in California to the southern and southeastern districts.

Suborder I. CACTEÆ.

No leaves proper: spines never barbed. Flower-bearing and spine-bearing areolæ distinct. Tube of the sessile solitary flowers well developed, often long. Seeds brown or black, mostly small. — The limits between the genera are arbitrary.

1. **Mamillaria.** Globose or oval plants, covered with spine-bearing tubercles. Flowers (usually small) from between the tubercles. Ovary naked. Seeds without albumen.
2. **Echinocactus.** Globose or oval plants, stouter than the last, usually ribbed; bundles of spines on the ribs. Flowers mostly larger, from the youngest part of the ribs close above the nascent bunches of spines. Ovary covered with sepals. Seeds albuminous.
3. **Cereus.** Oval or columnar plants, sometimes tall, ribbed or angled; bundles of spines on the ribs. Flowers usually larger, close above bundles of full grown (older) spines. Ovary covered with sepals. Seeds without albumen.

Suborder II. OPUNTIEÆ.

Leaves small, subulate, early deciduous. Sessile and solitary flowers from the same areolæ as the always barbed spines: tube of the flowers short, cup-shaped. Seeds larger, whitish, covered with a bony arillus.

4. **Opuntia.** Branching or jointed plants: joints flattened or cylindrical.

Suborder III. PEIRESCIEÆ, with flat persistent leaves, spines never barbed, flowers usually peduncled and often paniculate, with a very short tube, and large black albuminous seeds, includes the genus *Peirescia* of the tropics, in aspect very unlike the rest of the order. No species have been found in California, but they may be expected in the Peninsula.

1. MAMILLARIA, Haworth.

Flowers about as long as wide; the tube campanulate or funnel-shaped. Ovary, often hidden between the bases of the tubercles, as well as the exsert succulent berry, naked. Seeds yellowish-brown to black, exalbuminous or nearly so. Embryo mostly short and straight, with extremely short cotyledons parallel to the sides of the seed. — Small more or less globose or oval simple or cespitose plants, the spine-bearing areolæ borne on cylindric, oval, conic, or angular tubercles, which cover the body of the plant. Flowers from a distinct woolly or bristly areola at the base of these tubercles, fully open in sunlight, mostly only for a few hours.

§ 1. *Flowers usually small, lateral from the axils of older or full-grown tubercles. Our species have limpid juice and exsert ovaries.* — Eumamillaria.

1. **M. Goodridgii,** Scheer. Oval to subcylindrical, mostly single, covered with crowded ovate tubercles and a dense mass of gray and dusky thin spines; axils of the younger tubercles woolly and bristly: the 10 to 15 outer spines radiating and whitish; the 1 to 3 inner ones longer, stouter and dark brown, of which the stoutest is strongly hooked: lower sepals fringed: petals about 8, ovate, awned: stigmas 5 to 6: club-shaped berry scarlet: seeds obovate, minute, black, delicately pitted. — Salm. Cact. 1849, 91; Engelm. Cact. Mex. Bound. 8, t. 8, fig. 9 – 14.

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Common on sandy or gravelly soil or among rocks about San Diego (*Parry, Agassiz, Hitchcock*), and on the neighboring islands, and southward through the Peninsula, *W. Gabb.* From 2 or 3 to 6 or 7 inches high, 1 to 1½ thick; tubercles 2½ to 3 lines long; radial spines 2½ to 5, and central ones 5 to 7 lines long; flowers 9 to 12 lines in diameter, dirty yellowish tinged with red.

2. **M. Grahami,** Engelm. Similar to the last: smaller, with smaller less closely pitted seeds, but longer and more numerous (15 to 30) spines, and without axillary bristles. — Cact. Mex. Bound. 7, t. 6, fig. 1–8.

Common on the most rugged rocks on both sides of the Colorado (*Schott, Newberry*), and eastward into New Mexico. Heads 1 to 3 inches high, 1 to 1½ thick.

3. **M. phellosperma,** Engelm. Ovate to cylindrical, usually simple: tubercles long-oval, with wool and bristles in their axils, and 30 to 60 spines at the apex, in 2 or 3 series; the outer thinner and paler; the inner stouter and often darker; the 3 or 4 central spines stouter, dark brown, and one or several hooked: flowers with ciliate sepals and 12 to 13 acuminate petals: stigmas 5: berry obovate or clavate, crimson, containing rather few large globose reticulated and warty brown seeds, with a large spongy appendage. — Cact. Mex. Bound. 6, t. 7.

From the eastern slope of the mountains near San Felipe to the Mohave country, and throughout Western Arizona. Heads 2 to 5 inches high, 1½ to 2 inches thick; tubercles 4 to 7 lines long, not as much crowded as in the last two species, but with a much larger number of spines, 4 to 9 lines in length; flower dirty yellowish red, about an inch wide. The seed is partially imbedded in a curious spongy mass, an aril-like enlargement of the funiculus.

§ 2. *Flowers larger, vertical, from the base of a groove on the young or nascent tubercles.* — CORYPHANTHA.

4. **M. Arizonica,** Engelm. n. sp. Globose or ovate; tubercles long-cylindrical, ascending, deeply grooved, bearing numerous straight rigid spines: the 15 to 20 exterior spines whitish; the 3 to 6 interior ones stouter, deep brown above: flowers large, rose-colored: sepals 30 to 40, linear-subulate, fimbriate: petals 40 to 50, lance-linear, awned: stigmas 8 to 10, white: berry oval, green, with obovate compressed pitted light brown seeds.

On sandy and rocky soil in Northern Arizona, from the Colorado eastward (*Coues, Palmer, F. Bischoff*), and into Southern Utah (*J. E. Johnson*); probably in Southeastern California. Larger in all its parts than the foregoing species; 3 or 4 inches thick; tubercles an inch long; spines 5 to 15 lines long; flowers 2 to 2½ inches wide, very showy.

2. ECHINOCACTUS, Link & Otto.

Flowers about as long as wide. Ovary covered with sepaloid scales, naked or woolly in their axils. Fruit succulent or sometimes dry, covered with the persistent calyx-scales, sometimes enveloped in copious wool, and usually crowned with the persistent remnants of the flower. Seed obliquely obovate, black. Embryo curved over the small albumen; cotyledons parallel to the sides of the seed. — Mostly larger, sometimes gigantic, globose or depressed, or ovate, or rarely subcylindric, simple or very rarely cespitose; bunches of spines on the more or less vertical ribs. Flowers contiguous to and above the spines, on the latest growth of the plant, often from the nascent woolly areolæ and therefore more or less vertical, open only in sunlight.

* *Scales of the ovary ovate, orbicular, or cordate, and mostly fringed, their axils almost naked: fruit scaly, never woolly.* — Leiocarpi.

÷ *Spines smooth.*

1. **E. Whipplei,** Engelm. & Big. Heads solitary, globose or ovate, middle-sized, with 13 (to 15) compressed and interrupted ribs: of the 7 to 11 outer and 4 inner spines, the ivory-white upper ones are the longest and broadest and recurved or

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twisted ; the lower are shorter, darker, and terete, and the lowest middle one hooked : flowers 1 to $1\frac{1}{4}$ inches long, yellow : few (2 to 5) rounded fringed sepals on the ovary, 10 to 15 oblong ones on the tube : petals about 8 : stigmas 5 to 7, short : seeds large, minutely tuberculated. — Cact. of Pacif. R. Rep. iv. 28, t. 1 ; Bot. Ives Colorado Exp. 12.

On the lower Colorado, on the confines of California, Arizona, and Utah (*Bigelow, Newberry, H. Engelmann*), and to Southern Colorado, *Brandegee.* Heads 3 to 5 inches high ; spines 3 to 20 or 24 lines long, on prominent tubercles, which give the ribs a wavy or interrupted appearance : seeds $1\frac{1}{2}$ to $1\frac{3}{4}$ lines long.

2. **E. polyancistrus,** Engelm. & Big. Heads solitary, middle-sized, ovate to cylindrical, with 13 (to 17) interrupted ribs : outer spines 20 or more, white, the uppermost broader and longer ; central spines 5 to 10, the upper one broadest, longest, recurved, white, the others brown, terete, and mostly hooked : flowers yellow, 2 to $2\frac{1}{2}$ inches long, with about 8 rounded fringed sepals on the ovary : seeds as in the last. — Cact. of Pacif. R. Rep. iv. 29, t. 2, fig. 1, 2.

From the head-waters of the Mohave River (*Bigelow*) to the sage plains of Southwestern Nevada, *Gabb.* Perhaps too near the last, from which it is distinguished by the more numerous spines, many of the inner ones being hooked, the larger flowers, and more numerous sepals and petals. Heads 3 to 10 inches high, 2 to 4 thick ; larger spines of the Mohave form 3 to 5, of the Nevada plant only 1 or 2 inches long.

+ + *Spines, at least the larger ones, transversely ribbed or annulated.*

3. **E. viridescens,** Nutt. Heads solitary, middle-sized, globose or depressed, with about 13 obtuse tuberculated ribs and a woolly depressed summit : spines stout, reddish, straight or recurved, all annulated, about 12 radiating and 4 (to 6) stouter central ones : flowers greenish ($1\frac{1}{2}$ inches long), with numerous (25 or more) roundish denticulate imbricated sepals on the ovary, as many on the tube, and about the same number of oblong obtuse denticulate petals : stigmas 12 to 15, linear : berry pulpy, green, scaly, with numerous small pitted seeds. — Torr. & Gray, Fl. i. 554 ; Engelm. Cact. Mex. Bound. 24, t. 29.

About San Diego, from the sea-beach to the arid hills and ridges inland ; cultivated in Europe under the name of *E. Californicus.* Heads 4 to 7 inches in diameter, 3 to 5 inches high, more rarely globose ; woolly vertical area (the youngest growth, where the spines are not yet developed) an inch wide, surrounded by the numerous flowers.

4. **E. cylindraceus,** Engelm. Heads middle-sized or large, oval or cylindrical, often proliferous at base, with 21 (to 27) obtuse somewhat tuberculate ribs, and a woolly spineless depressed top : reddish spines all stout and annulated, recurved or flexuous, 12 to 18 exterior, the lowest usually hooked, and 4 very stout central ones : yellowish flowers 2 inches long, with 40 to 50 rounded fringed sepals on the ovary, and about 25 fringed petals : stigmas and fruit as in the last. — Cact. Mex. Bound. 25, t. 30. *E. viridescens,* var. (?) β. *cylindraceus,* Engelm. in Am. Jour. Sci. 2 ser. xiv. 338.

Colorado desert (*Palmer, Bischoff*), to the eastern slope of the mountains near San Felipe, *Parry.* Closely allied to the last, from which it is distinguished by its higher growth, more numerous ribs, larger and more numerous spines, and larger flower and fruit. Young plants globose, with fewer ribs ; older ones much higher than thick, 2 or 3 feet high, a foot in diameter, with 20 to nearly 30 ribs ; radial spines 1 or 2, the central 2 inches or over in length ; green berry about an inch thick.

5. **E. Emoryi,** Engelm. Heads solitary, large, globose or oval, with 13 to 20 obtuse tuberculated ribs : on the ovate areolæ 8 or 9 robust reddish spines, angled and annulated and slightly recurved, a stouter and longer one in the centre, turned downward or more or less hooked : flowers large, purple, with numerous (25) reniform ciliate sepals on the ovary and as many spatulate ones on the tube : petals about the same number, lanceolate, laciniate-toothed towards the acuminate tip : stigmas 18 to 20, erect, almost as long as the very robust style. — Emory Rep. 156 ; Cact. Mex. Bound. 23, t. 28.

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Arizona and Sonora to the Mohave region (*Emory, Bigelow, Schott*), and into Lower California, *Gabb.* Plants 1 or 2 and even 3 feet high, 1 or 2 feet thick; all the spines very stout and strongly cross ribbed, 1½ to 3 inches long; flowers 3 inches long, purplish brown outside; petals red, with yellow margin; seeds much like those of the next species.

6. **E. Wislizeni,** Engelm. Very large, oval, at last cylindrical or often club-shaped, with 21 to 30 compressed crenate ribs: oblong areolæ bearing various spines; in the centre 4 stout cross-ribbed ones, the lower one flattened and curved or hooked; above and below 6 to 10 slightly ribbed, and laterally 10 to 20 long slender often flexuous ones: flowers greenish yellow, 2 to 2½ inches long: ovary and fruit imbricately covered with 30 or 40 to 60 or 100 roundish cordate sepals; inner sepals spatulate, 20 to 30: petals as many, lanceolate, crenulate: style divided to the middle into 12 to 20 stigmas: yellowish berry at last hard and dry; seeds over a line long, reticulated. — Wislizenus Rep. 1848, note 14; Cact. Mex. Bound. 23, t. 25, 26.

From the Rio Grande to the Colorado, northward into Utah and west into California; flowering throughout the summer and autumn. Often 3 and even 4 feet high and 1 or 2 in diameter, with a woolly spineless top; spines 1½ to 2½ inches long, grayish red, the thinner ones whitish. *E. Lecontei,* Engelm., seems to have been founded on weaker plants of this, with the seeds of perhaps No. 4.

* * *Scales of the ovary subulate, often spinescent, copiously woolly in their axils; fruit enveloped in wool.* — Eriocarpi.

7. **E. polycephalus,** Engelm. & Big. Middle-sized or large, globose, at last cylindric, sprouting from the base; ribs 13 to 21, acute: circular areolæ bearing 8 to 12 stout compressed annulated curved reddish gray spines: flowers enveloped in a mass of dense white wool: petals about 30, lance-linear, yellow: stigmas 8 to 11, linear: dry berry full of large angular seeds. — Cact. of Pacif. R. Rep. iv. 31, t. 3, fig. 4 – 6.

Gravelly or stony soil on the Colorado and Mohave rivers, and in the Californian desert (*Bigelow*); flowering in February, fruiting in March. Heads sometimes 20 or 30 from a single base, ½ to 1½ feet high, the larger cylindric ones 2 to 2½ feet high; spines either all radial, or 6 to 8 outer ones surrounding 4 stouter central ones; flowers 1½ inches long; about 100 rigid dark pointed sepals upon the ovary are hidden in the wool, those of the tube similar and about as many; petals about 30, narrow, yellow, just emerging from the wool; seeds 2 lines long, wrinkled and minutely tuberculate.

3. CEREUS, Haworth.

Flowers about as long as wide or elongated. Scales of the ovary distinct, with naked or woolly axils, or almost obsolete and the axils spiny. Berry succulent, covered with spines or scales or almost naked. Seeds black, without albumen. Embryo short and straight or curved or hooked; cotyledons usually contrary to the sides of the seed. — Plants of all sizes, low or climbing or erect, sometimes enormous; spine-bearing areolæ on vertical ribs. Flowers from the older or, at least, fully formed parts of the plant, not from any preformed areola, but bursting through the epidermis just above the bunches of spines; some open only in sunlight, others only at night, others again are not thus influenced. Fruit often edible, sometimes of very large size.

§ 1. *Low and usually cespitose plants, mostly with numerous oval or cylindric heads, short flowers, green stigmas, and spiny fruit: seeds subglobose, covered with confluent tubercles: embryo straight, with very short cotyledons.* — Echinocereus.

1. **C. Engelmanni,** Parry. Heads several from a single base, oval or cylindrical, with 11 to 13 interrupted ribs: radial spines about 13, whitish, often somewhat angled, straight or curved, the lateral ones the longest; central ones 4, longer,

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angular, variously colored: large purple flowers open only in sunlight: ovary and fruit with 25 to 30 spiny areolæ, 15 to 20 upper sepals, and as many lance-oblong petals: stigmas about 12, erect. — Am. Jour. Sci. 2 ser. xiv. 338; Cact. of Pacif. R. Rep. iv. 35, t. 5, fig. 4 – 10.

From the eastern slopes of the Southern Sierra Nevada, at San Felipe, into Arizona and Utah, apparently abundant, *Parry*, *Newberry*, *Palmer*, and others. Heads usually 4 to 6 together, 5 to 10 inches high, 2 or 3 thick; outer spines $\frac{1}{4}$ to $\frac{3}{4}$, inner 1 or 2 inches long; flowers $2\frac{1}{2}$ to 3 inches long and wide, appearing in June.

§ 2. *Prismatic or cylindric, mostly branching: flowers usually longer than wide: stigmas whitish: seeds obovate, usually smooth or pitted: embryo with foliaceous curved cotyledons.* — EUCEREUS.

* *Ovary and fruit spiny.*

2. **C. Emoryi**, Engelm. Stems erect, branching from the base, cylindric, with 16 to 20 ribs, closely set with prominent hemispherical areolæ bearing numerous (30 to 50) thin straight yellow spines $\frac{1}{4}$ to 1 or $1\frac{3}{4}$ inches long; the 3 to 6 inner ones longer and deflexed: flowers short, greenish yellow, crowded on one side of the top of the stems: ovary with few short spines, which become formidable upon the subglobose fruit. — Am. Jour. Sci. l. c.; Cact. Mex. Bound. 40, t. 60, fig. 1–4.

On the gravelly mesas near the sea-shore at San Diego (*Parry*, *Agassiz*, *Hitchcock*), and quite abundant on rocky hills from Los Angeles to the Salinas Valley (*Brewer*), and into the Peninsula to Rosario, *Gabb*. Stems 2 to 4 feet high, $1\frac{1}{2}$ to 2 inches thick, often from a prostrate rooting base, and forming dense thickets; areolæ 2 lines wide and 3 or 4 lines apart, densely covered with the thin sharp and very brittle spines; flowers usually on one side only, like those of § *Pilocereus*, $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long and a little less wide; fruit about an inch long; seeds over a line long, shining, minutely tuberculate.

* * *Ovary and fruit scaly.*

C. GIGANTEUS, Engelm., 15 to 30 or even 40 feet high, very stout, with few erect branches towards the upper part, cream-white short-tubed flowers, and large oval edible fruit, which at maturity bursts irregularly, and

C. THURBERI, Engelm., 10 to 15 feet high, more slender, with many equally high ascending branches from the base, similar flowers, and larger globose delicious fruits, are found in the adjoining territories of Arizona and Lower California, and may be looked for in this State.

§ 3. *Tall, cylindric, mostly unbranched; upper flower-bearing portion with more crowded areolæ and longer denser thinner bristly or hairy spines: flowers short: seeds as in the last.* — PILOCEREUS.

C. SCHOTTII, Engelm., 4 to 10 feet high, the lower part 5-angled, with distant areolæ and few very short and stout spines; the upper flowering portion deeply 5-ribbed, with close-set areolæ bearing numerous setaceous spines, almost hiding the small flowers and small berries, — from the same localities as the last two species, — may also be found in Southern California.

4. OPUNTIA, Tourn., Miller.

Tube of the flower very short, cup-shaped. Petals spreading or rarely erect. Ovary with bristle-bearing areolæ in the axils of small terete deciduous sepals. Berry succulent or sometimes dry, marked with bristly or spiny areolæ, truncate with a wide umbilicus. Seeds large, white, compressed, with the embryo coiled around the albumen: cotyledons large, foliaceous. — Articulated much-branched plants, of various shapes, low and prostrate, or erect and shrub-like; young branches with small terete subulate early deciduous leaves, and in their axils an areola with numerous short easily detached bristles and, usually, stouter spines, all barbed. Flowers on the joints of the previous year, on the same areolæ with the spines, mostly large, open only in sunlight. Fruit often edible, often large.

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§ 1. *Joints compressed: rhaphe forming a prominent bony margin around the seed: embryo completing a little more than one circle around the scanty albumen; cotyledons contrary to the sides of the seed.* — PLATOPUNTIA.

* *Fruit pulpy.*

1. **O. Engelmanni,** Salm. Bushy, erect-spreading, much branched: obovate joints ½ to 1 foot long, sparsely armed with bundles of 1 to 3 or sometimes even 5 spines, the stouter ones angled, yellow, sometimes with a red-brown base; old trunks losing their spines: flowers yellow, about 3 inches wide: petals broadly obovate, truncate: the purple oval juicy berry about 2 inches long, with a large flat umbilicus, and with 20 to 25 brown-woolly and slightly bristly areolæ. — Salm. Cact. cult. 1849, 235; Engelm. Cact. Mex. Bound. 47, t. 75, fig. 1 – 4.

Var. β. **occidentalis,** Engelm. Spines fewer, stouter, farther apart: seeds larger. — *O. occidentalis,* Engelm. & Big. in Cact. of Pacif. R. Rep. iv. 38, t. 7.

Var. (?) γ. **littoralis,** Engelm. Joints often larger, 1 to 1½ feet long: bunches of longer and more slender spines closer together: fruit similar, but with 40 to 50 areolæ: seeds smaller.

Apparently a polymorphous species, extending from Southern Texas to the Pacific, which will probably be identified with some older Mexican species when these plants come to be better understood. The two forms of California are easily distinguished by the characters given above. The var. *occidentalis* has been found on the western slope of the mountains east of Los Angeles and southward to San Isabel, etc., at an elevation of 1,000 to 2,000 feet, *Parry, Schott.* The areolæ of the joints are 1½ to 2 inches apart; spines ½ to 1¼ inches long; flowers 3 to 3½ inches wide, yellow with orange centre; fruit often 1½ inches thick; seeds 2½ to 2¾ lines wide. The second form, var. *littoralis,* extends on the coast from Santa Barbara and the islands in its gulf (*O. Tittmann*) to San Diego, and southward, *G. N. Hitchcock.* Seeds 2 to 2½ lines in diameter. — The limits of these species are difficult to circumscribe, especially because complete specimens are so hard to preserve and extensive observations in the field have not yet been made. Of the three following no more is known now than there was twenty years ago.

2. **O. chlorotica,** Engelm. & Big. Erect, bushy; old trunks covered with large areolæ which, retaining their vitality, constantly produce new spines; joints large, pale green, orbicular-obovate, with close-set areolæ, each bearing 1 to 5 slender deflexed yellow spines: flowers yellow, 2½ to 3 inches wide, with spatulate petals. — Cact. of Pacif. R. Rep. iv. 38, t. 6, fig. 1 – 3.

From Mohave Creek eastward to Bill Williams Mountain in Arizona (*Bigelow*); 4, 5, or even 7 feet high, readily recognized by the very spiny trunk and very pale broad joints ¾ to 1 foot long.

3. **O. angustata,** Engelm. & Big. Prostrate or ascending, with obovate elongated joints: large oblong areolæ sparse, bearing brown bristles and few (1 to 3) deflexed spines: fruit rather small, deeply umbilicate, with few large seeds. — Cact. l. c. 39, t. 7, fig. 3, 4.

From Cajon Pass eastward into Arizona, *Bigelow.* Joints 10 inches long or more, not half as wide above, narrowed downward; berry 1½ inches long, narrow; seeds 3 lines wide.

4. **O. Mohavensis,** Engelm. & Big. Prostrate, with large nearly orbicular joints, and more numerous (2 to 6) stout and long often curved brown spines. — Cact. l. c. 40, t. 9, fig. 6 – 8.

On Mohave Creek, *Bigelow.* A doubtful form, of which flowers and fruit are unknown. It seems to approach *O. phœacantha* of New Mexico, and perhaps even the stouter western forms of *O. Rafinesquii.* It is indicated here merely for the attention of future explorers.

O. TUNA and O. FICUS-INDICA, Mill., are probably both naturalized about the old missions; one with stout yellow spines and insipid fruit, the last with weaker whitish spines, fruit delicious.

\+ *Fruit dry.*

++ *Joints and fruit spiny.*

5. **O. rutila,** Nutt. Prostrate, with thick obovate or elongated joints: areole close, armed with numerous slender reddish or gray flexible spines: large flowers purple: stigmas green: berry deeply umbilicate, with large flat broadly margined

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ivory-white seeds. — Nutt. in Torr. & Gray, Fl. i. 155. *O. erinacea*, Engelm. & Big. Cact. l. c. 47, t. 13, fig. 8 – 11.

From the Mohave region (*Bigelow*) to Southern Utah (*Palmer*), and up the Colorado Valley, *Nuttall*. This plant seems to be Nuttall's long-lost *O. rutila*, and also *O. erinacea* of the Mohave, the flower of which is unknown. Joints 2 to 4 inches long, 1½ to 3 wide, and often, especially in young plants, thick and almost terete, thus approaching to *O. fragilis:* seeds 3 lines wide.

+ + *Joints and fruit pubescent, without spines.*

6. **O. basilaris,** Engelm. & Big. Low, with obovate often retuse or fan-shaped joints, branching only from the base: areolæ very close, densely covered with short brown bristles: flowers large, rose-purple: fruit subglobose, with deep umbilicus, and rather few large and thick seeds. — Cact. l. c. 43, t. 13, fig. 1 – 5.

From the eastern base of the mountains near San Felipe through the desert and into Arizona, *Bigelow, Newberry, Palmer,* &c. Joints 5 to 8 inches long, and often as wide near the top; distinct from all other species of this region in its mode of growth, its pubescence, absence of spines proper, and its very large seeds (3½ to 5 lines wide), which have a thicker but less prominent rim than any other of this section.

§ 2. *Joints cylindrical, more or less tuberculated: rhaphe usually not prominent, therefore seed not margined: embryo forming less than one circle around the more copious albumen; cotyledons inconstant, contrary, oblique, or parallel to the sides of the seed.* — CYLINDROPUNTIA.

* *Low plants with clavate joints, without a firm ligneous skeleton: larger spines angular-compressed, without sheaths: berries dry and very bristly.*

7. **O. Emoryi,** Engelm. Joints long, clavate-cylindrical, with linear-oblong and very prominent tubercles: spines numerous (15 to 30) in the upper bundles, the 5 to 9 inner ones stouter, angular-compressed: seeds large, irregular, the rhaphe indistinct. — Cact. Mex. Bound. 53, t. 70, 71.

Colorado desert from San Felipe (*Parry, Bigelow*) eastward, and into Arizona (*Schott, Palmer*) and the Peninsula, *Gabb*. Joints 5 to 9 inches long, 1 to 1½ thick; tubercles 1 to 1½ inches long; fruit 2 to 2½ inches long; seeds 2½ to 3 lines wide.

8. **O. Parryi,** Engelm. Joints short, ovate-clavate with oblong tubercles: spines 12 to 20, reddish gray, the 3 or 4 inner ones stouter, triangular-compressed: seeds smaller, regularly circular, with a broad and distinct rhaphe. — Am. Jour. Sci. 2 ser. xiv. 339; Cact. of Pacif. R. Rep. iv. 48, t. 22, fig. 4 – 7.

Gravelly plains near the Mohave River (*Bigelow*), and through the desert to the base of the mountains, *Parry*. Joints 3 or 4 inches long, 1¼ thick; tubercles about ¾ inch long.

9. **O. pulchella,** Engelm. Joints smaller, slender: tubercles small: spines 15 to 25, of which usually one only is stouter, flattened, deflexed: flowers purple: ovary and fruit with long flexuous bristles: seeds small, with a broad rhaphe. — Trans. Acad. St. Louis, ii. 201; Bot. King Exp. 119; fig. in Simpson Rep. ined.

Sandy deserts of Southeastern California and Nevada, and among the sage-bushes of the mountains, *H. Engelmann, W. Gabb, Watson*. The prettiest and smallest of the clavate *Opuntiæ*, the only one with purple flowers; joints rarely longer than 1 or 2 inches; flowers 1¼ to 1½ inches wide; seeds 2 lines in diameter.

* * *More or less erect, much branched: joints cylindric: ligneous skeleton solid or tubular and reticulated: larger spines terete, coated with a loose sheath.*

+ *Fruit dry and spiny: flowers yellow.*

10. **O. tessellata,** Engelm. Much branched, bushy, from a stout ligneous trunk: joints slender, covered with angular flattened ashy-gray tubercles, bearing above long single loosely sheathed spines: flowers small, yellow: small oval fruit covered with long brown bristles: seeds with a very broad flat rhaphe. — Cact. of Pacif. R. Rep. iv. 52, t. 21.

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Throughout the Californian desert from the mountains to the Colorado, and into Arizona. Bushes 4 to 6 feet high; trunk solid, sometimes 2 inches in diameter; joints only $\frac{1}{4}$ or $\frac{1}{3}$ inch thick; spines an inch or two long; flowers 6 to 9 lines wide; fruit 9 lines long; seeds 2 lines wide.

11. **O. echinocarpa**, Engelm. & Big. A low much-branched and spreading shrub: joints ovate-clavate, densely covered with numerous spines (3 or 4 stouter, 8 to 16 weaker ones in a bunch), which are loosely coated with a whitish glistening sheath: flowers pale greenish yellow, about $1\frac{1}{2}$ inches wide: fruit depressed, deeply umbilicate, very spiny: seeds few (2 lines wide), with a broad flat rhaphe. — Cact. l. c. 51, t. 18, fig. 5 – 10; Bot. Ives Colorado Exp. 14.

Common in the desert from the mountains to the Colorado River, and into Arizona. Usually only 1 to $1\frac{1}{2}$ feet high, very showy from its conspicuous shining spines, an inch or two long.

12. **O. serpentina**, Engelm. A large straggling densely branched shrub: joints elongated, covered with oblong prominent tubercles, which bear bunches of numerous short spines, very soon losing their inconspicuous sheaths: flowers clustered, greenish yellow, reddish externally: petals spatulate, obtuse: stigmas 8, whitish: fruit broadly oval, deeply umbilicate: seeds thick, irregular, with a narrow rhaphe. — Am. Jour. Sci. 2 ser. xiv. 338.

Common near the coast, at San Diego, *Parry*, *Hitchcock*. Bushes 3 to 5 feet high; spines 8 to 15 in a bunch, 3 to 6 lines long; flowers $1\frac{1}{2}$ inches wide; fruit about 9 lines long.

++ *Fruit green, fleshy, and without spines: flowers red.*

13. **O. prolifera**, Engelm. An arborescent shrub with elongated joints, covered with oblong obtuse tubercles, which bear 3 to 6 or 8 spines, obscurely sheathed: flowers densely clustered at the ends of the branches, small, brick-red: fruit clavate, obovate, or subglobose, strongly tubercled, deeply umbilicate, almost always sterile and often proliferous: seeds large, regular, with a broad prominent rhaphe. — Am. Jour. Sci. l. c.

San Diego (*Parry*, *Schott*, *Agassiz*), up the coast to San Buenaventura, and southward into the Peninsula, *Gabb*. Larger than the last, with stouter more strongly tubercled joints, and fewer and shorter spines, and easily distinguished from it in flower and fruit: longest spines 1 to $1\frac{1}{2}$ inches long; flowers $1\frac{1}{2}$ inches wide; seeds 3 lines in diameter, with a more prominent and broader rhaphe than its allies.

Several other *Opuntiæ*, belonging to this last section, all with red flowers and fleshy fruit, are found in Western Arizona and may also be expected on the western side of the Colorado. They are all erect much-branched bushes, covered with shining sheathed spines. The more northern

O. BIGELOVII, Engelm., has short tubercles.

O. FULGENS, Engelm. & Big., and O. MAMILLATA, Schott, both south of the Gila (perhaps forms of a single species), have very prominent tubercles, and small curiously irregular seeds $1\frac{1}{2}$ to 2 lines long, with a linear rhaphe.

O. LEPTOCAULIS, DC., including *O. frutescens*, Engelm., *O. vaginata*, Engelm., and several other synonyms, is the slenderest of all *Opuntiæ*, with long branches scarcely thicker than a goose-quill, small yellow flowers, and a small pulpy scarlet fruit; common throughout all Northern Mexico, ranging into Texas, New Mexico, and Western Arizona, and may also be found west of the Colorado River.

ORDER XLIV. FICOIDEÆ.

A miscellaneous group, chiefly of fleshy or succulent plants, with mostly opposite leaves and no stipules; differing from *Caryophyllaceæ* and *Portulacaceæ* by having distinct partitions to the ovary and capsule (which are therefore 2 – many-celled); the petals and stamens sometimes numerous in the manner of *Cactaceæ* (but the former wanting in most of the genera); agreeing with all these orders in the campylotropous or amphitropous seeds; the slender embryo curved partly or completely round a mealy albumen.

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Ea 210

Cactaceæ of California

by

S. Englemann.

1876

From "Flora of Calif."

78

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Advance sheet of
Flora of California
Publ. 1876.

To the Library of M. B. G.
from Dr Engelmann
June 9/76

(78)

elongated and climbing, from large fusiform perennial roots; leaves cordate, palmately 5–7-lobed or angled; tendrils 2–5-cleft; flowers small, white. Flowering in early spring. — Watson, Proc. Am. Acad. xi. 138.

A genus confined to the Pacific Coast, the species not well known, nearly allied to the *Echinocystis* of the Atlantic States, to which it has been referred, but from which it is separated by its thick perennial roots, its large turgid immarginate seeds, and its thick fleshy cotyledons, which remain under ground in germination. The fruit in some species appears to be wholly indehiscent.

1. **M. Californica,** Torr. Nearly glabrous, with short scattered curved hairs: stem 20 to 30 feet long: leaves 2 to 6 inches broad, with a deep closed sinus, more or less deeply 5–7-lobed, but rarely to the middle; lobes broad-triangular, abruptly acute, mucronate, the sinuses obtuse: sterile flowers (5 to 20) in slender racemes 3 to 5 inches long, somewhat pubescent, on slender pedicels a line or two long; corolla 3 or 4 lines broad: fertile flowers 5 or 6 lines broad, without abortive stamens: ovary globose, densely echinate, 2- (rarely 3–4)-celled, the cells 1–2-ovuled; lower ovule ascending, the upper horizontal, attached to the outer side of the cell: fruit globose or ovoid, 2 inches long, densely covered with stout almost pungent spines ($\frac{1}{2}$ to 1 inch long), 1–4-seeded: seed obovoid, 10 lines long, 6 in diameter, surrounded by a shallow groove or darker line, the hilum at the narrow base. — Pacif. R. Rep. vi. 74. *Echinocystis fabacea,* Naudin, Ann. Sci. Nat. 4 ser. xii. 154, t. 9, and xvi. 188.

Near the coast from San Diego to Punta de los Reyes. A specimen from Knight's Ferry on the Stanislaus (*Bigelow*) has the ripe fruit much less strongly armed. Specimens from Cocomungo (*Bigelow*) may also belong here, though having the leaves more deeply divided with narrower lobes, and the 4-celled fruit with 4 or 5 seeds in each cell.

2. **M. Marah,** Watson, l. c. Scabrous or nearly smooth: stems 10 to 30 feet long: leaves cordate or reniform, 3 to 6 inches broad, lobed nearly as in the last: sterile flowers a half to an inch broad, in simple or panicled loosely flowered racemes, 4 to 12 inches long; pedicels slender, 2 to 6 lines long: fertile flowers with abortive stamens: ovary oblong-ovate, more or less covered with soft spines, 2–3-celled; ovules 1 to 4 or more in each cell, ascending or horizontal, attached to the outer side of the cell: fruit ovate-oblong, 4 inches long, somewhat attenuate at each end, more or less muricate all over with weak spines: seeds horizontally imposed, flattish, suborbicular or irregularly elliptical, an inch in diameter, about half as thick, with an obscure marginal furrow and prominent lateral hilum. — *Marah muricatus,* Kellogg, Proc. Calif. Acad. i. 38.

Common around and near San Francisco Bay. Catalina Island (*Baker*), but sterile flowers only.

3. **M. Oregona,** Torr. Much resembling the last: fertile flowers without abortive stamens: young fruit similar in shape, sparingly muricate with soft spines, 3–4-celled, the cells imbricated above each other, 1-seeded: mature fruit (so far as known) an inch or two long, unarmed, with very thin walls: seeds as in the last, or somewhat smaller (8 to 11 lines broad), attached to the outer side of the cell. — Pacif. R. Rep. vi. 74.

Common in Washington Territory and said to range from Puget Sound to Klamath Lake.

4. **M. muricata,** Watson, l. c. Nearly glabrous or somewhat scabrous, often more or less glaucous: stems 6 to 8 feet long: leaves 2 to 4 inches broad, orbicular-cordate with a nearly closed sinus or broadly reniform, deeply 5-lobed, the divisions all broader above and sharply sinuate-toothed or -lobed: sterile racemes slender, often very few-flowered: fertile flowers 3 to 4 lines broad, without abortive stamens, on slender pedicels an inch or two long: ovary smooth or sparingly muricate, oblong, acute at each end: fruit nearly globose, an inch in diameter, naked or with a few short weak spines near the base, 2-celled, 2-seeded: seed nearly globose, half an inch in diameter, ascending, attached to the outer side of the cell near the base, the margin smooth. — *Echinocystis muricata,* Kellogg, Proc. Calif. Acad. i. 57.

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Angels Camp, Calaveras County (*Rich, Bigelow*) ; near Placerville, *Kellogg, Bolander*. Specimens collected by Fremont, Hulse, and others, in the same region (from the Mokelumne River to the Upper Sacramento), may belong here though with the ovary 3- or 4-celled, and in some other minor respects different.

5. **M. Guadalupensis**, Watson, l. c. Nearly glabrous, the inflorescence somewhat pubescent: leaves thin, 3 to 8 inches broad, 3–5-lobed to the middle, the lower lobes quadrangular, the upper acuminate, with few short teeth: racemes nearly simple, 4 to 6 inches long: calyx-teeth filiform: corolla 6 to 8 lines broad: fertile flowers without abortive stamens: ovary on a slender pedicel an inch long, ovoid, densely covered with short soft spines, 2-celled; ovules 1 or 2 in each cell, ascending: fruit ovoid, $1\frac{1}{2}$ to 2 inches long, acute above, somewhat pubescent and with short scattered stiff spines, usually 2-seeded: seeds subglobose, an inch in diameter, attached to the inner side of the cell, the margin smooth.

Guadalupe Island, on high rocks near the centre of the island, *Palmer*, 1875.

Order XLII. DATISCACEÆ.

A very small and peculiar order, chiefly represented by the following genus of only two species.

DATISCA, Linn.

Flowers diœcious, sometimes perfect. Calyx of sterile flowers very short, with 4 to 9 unequal lobes: stamens 10 to 25; filaments short: rudimentary ovary none. Pistillate flowers with calyx-tube ovoid, somewhat 3-angled, 3-toothed: stamens three, when present, alternate with the teeth: styles 3, bifid, opposite the teeth, the linear lobes stigmatic on the inner side. Capsule oblong, coriaceous, 1-celled, opening at the apex between the styles. Seeds very numerous and small, in two to several rows upon the 3 parietal placentæ: embryo cylindrical, in the axis of small albumen.—Smooth stout perennial herbs; leaves unequally pinnatifid, with coarsely toothed lanceolate segments, the upper scarcely lobed; flowers axillary, fascicled, nearly sessile.

Only two species known, one native of W. Asia, the other of California.

1. **D. glomerata**, Benth. & Hook. Erect, 2 or 3 feet high or more, branching: leaves ovate to lanceolate in outline, acuminate, 6 inches long, the numerous floral ones shorter and more narrowly lanceolate: flowers 4 to 7 in each axil of the elongated leafy raceme, the fertile mostly perfect: anthers nearly sessile, 2 lines long: styles longer than the ovary: capsule oblong-ovate, 3 or 4 lines long, slightly narrowed toward the truncate triangular 3-toothed summit.—Gen. Pl. i. 845. *Tricerastes glomerata*, Presl, Rel. Hænk. ii. 88, t. 64; Lindl. Veg. Kingd. 316, fig.

On stream-banks from Napa County to San Bernardino, and in the foot-hills of the Sierra Nevada from Amador to Tuolumne County.

Order XLIII. CACTACEÆ. By Dr. George Engelmann.

Green fleshy and thickened persistent mostly leafless plants, of peculiar aspect: globular or columnar, tuberculated or ribbed, or jointed and often flattened, usually armed with bundles of spines from the "*areolæ*," which constitute the axils of the (mostly absent) leaves. Flowers with numerous sepals, petals, and stamens, usually

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in many series, the cohering bases of all of which coat the inferior 1-celled many-ovuled ovary, and above it form a tube or cup, nectariferous at base. Style 1, with several or numerous stigmas. Fruit a pulpy or rarely dry 1-celled berry, with numerous campylotropous seeds (without or with some albumen) on several parietal placentæ.

An order of few genera, comprising a large number of species, peculiar to the warmer parts of America, and confined in California to the southern and southeastern districts.

Suborder I. CACTEÆ.

No leaves proper: spines never barbed. Flower-bearing and spine-bearing areolæ distinct. Tube of the sessile solitary flowers well developed, often long. Seeds brown or black, mostly small. — The limits between the genera are arbitrary.

1. **Mamillaria.** Globose or oval plants, covered with spine-bearing tubercles. Flowers (usually small) from between the tubercles. Ovary naked. Seeds without albumen.
2. **Echinocactus.** Globose or oval plants, stouter than the last, usually ribbed; bundles of spines on the ribs. Flowers mostly larger, from the youngest part of the ribs close above the nascent bunches of spines. Ovary covered with sepals. Seeds albuminous.
3. **Cereus.** Oval or columnar plants, sometimes tall, ribbed or angled; bundles of spines on the ribs. Flowers usually larger, close above bundles of full grown (older) spines. Ovary covered with sepals. Seeds without albumen.

Suborder II. OPUNTIEÆ.

Leaves small, subulate, early deciduous. Sessile and solitary flowers from the same areolæ as the always barbed spines: tube of the flowers short, cup-shaped. Seeds larger, whitish, covered with a bony arillus.

4. **Opuntia.** Branching or jointed plants: joints flattened or cylindrical.

Suborder III. PEIRESCIEÆ, with flat persistent leaves, spines never barbed, flowers usually peduncled and often paniculate, with a very short tube, and large black albuminous seeds, includes the genus *Peirescia* of the tropics, in aspect very unlike the rest of the order. No species have been found in California, but they may be expected in the Peninsula.

1. MAMILLARIA, Haworth.

Flowers about as long as wide; the tube campanulate or funnel-shaped. Ovary, often hidden between the bases of the tubercles, as well as the exsert succulent berry, naked. Seeds yellowish-brown to black, exalbuminous or nearly so. Embryo mostly short and straight, with extremely short cotyledons parallel to the sides of the seed. — Small more or less globose or oval simple or cespitose plants, the spine-bearing areolæ borne on cylindric, oval, conic, or angular tubercles, which cover the body of the plant. Flowers from a distinct woolly or bristly areola at the base of these tubercles, fully open in sunlight, mostly only for a few hours.

§ 1. *Flowers usually small, lateral from the axils of older or full-grown tubercles. Our species have limpid juice and exsert ovaries.* — Eumamillaria.

1. **M. Goodridgii,** Scheer. Oval to subcylindrical, mostly single, covered with crowded ovate tubercles and a dense mass of gray and dusky thin spines; axils of the younger tubercles woolly and bristly: the 10 to 15 outer spines radiating and whitish; the 1 to 3 inner ones longer, stouter and dark brown, of which the stoutest is strongly hooked: lower sepals fringed: petals about 8, ovate, awned: stigmas 5 to 6: club-shaped berry scarlet: seeds obovate, minute, black, delicately pitted. — Salm. Cact. 1849, 91; Engelm. Cact. Mex. Bound. 8, t. 8, fig. 9 – 14.

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Common on sandy or gravelly soil or among rocks about San Diego (*Parry*, *Agassiz*, *Hitchcock*), and on the neighboring islands, and southward through the Peninsula, *W. Gabb.* From 2 or 3 to 6 or 7 inches high, 1 to 1½ thick; tubercles 2½ to 3 lines long; radial spines 2½ to 5, and central ones 5 to 7 lines long; flowers 9 to 12 lines in diameter, dirty yellowish tinged with red.

2. **M. Grahami,** Engelm. Similar to the last: smaller, with smaller less closely pitted seeds, but longer and more numerous (15 to 30) spines, and without axillary bristles. — Cact. Mex. Bound. 7, t. 6, fig. 1–8.

Common on the most rugged rocks on both sides of the Colorado (*Schott*, *Newberry*), and eastward into New Mexico. Heads 1 to 3 inches high, 1 to 1½ thick.

3. **M. phellosperma,** Engelm. Ovate to cylindrical, usually simple: tubercles long-oval, with wool and bristles in their axils, and 30 to 60 spines at the apex, in 2 or 3 series; the outer thinner and paler; the inner stouter and often darker; the 3 or 4 central spines stouter, dark brown, and one or several hooked: flowers with ciliate sepals and 12 to 13 acuminate petals: stigmas 5: berry obovate or clavate, crimson, containing rather few large globose reticulated and warty brown seeds, with a large spongy appendage. — Cact. Mex. Bound. 6, t. 7.

From the eastern slope of the mountains near San Felipe to the Mohave country, and throughout Western Arizona. Heads 2 to 5 inches high, 1½ to 2 inches thick; tubercles 4 to 7 lines long, not as much crowded as in the last two species, but with a much larger number of spines, 4 to 9 lines in length; flower dirty yellowish red, about an inch wide. The seed is partially imbedded in a curious spongy mass, an aril-like enlargement of the funiculus.

§ 2. *Flowers larger, vertical, from the base of a groove on the young or nascent tubercles.* — CORYPHANTHA.

4. **M. Arizonica,** Engelm. n. sp. Globose or ovate; tubercles long-cylindrical, ascending, deeply grooved, bearing numerous straight rigid spines: the 15 to 20 exterior spines whitish; the 3 to 6 interior ones stouter, deep brown above: flowers large, rose-colored: sepals 30 to 40, linear-subulate, fimbriate: petals 40 to 50, lance-linear, awned: stigmas 8 to 10, white: berry oval, green, with obovate compressed pitted light brown seeds.

On sandy and rocky soil in Northern Arizona, from the Colorado eastward (*Coues*, *Palmer*, *F. Bischoff*), and into Southern Utah (*J. E. Johnson*); probably in Southeastern California. Larger in all its parts than the foregoing species; 3 or 4 inches thick; tubercles an inch long; spines 5 to 15 lines long; flowers 2 to 2½ inches wide, very showy.

2. ECHINOCACTUS, Link & Otto.

Flowers about as long as wide. Ovary covered with sepaloid scales, naked or woolly in their axils. Fruit succulent or sometimes dry, covered with the persistent calyx-scales, sometimes enveloped in copious wool, and usually crowned with the persistent remnants of the flower. Seed obliquely obovate, black. Embryo curved over the small albumen; cotyledons parallel to the sides of the seed. — Mostly larger, sometimes gigantic, globose or depressed, or ovate, or rarely subcylindric, simple or very rarely cespitose; bunches of spines on the more or less vertical ribs. Flowers contiguous to and above the spines, on the latest growth of the plant, often from the nascent woolly areolæ and therefore more or less vertical, open only in sunlight.

* *Scales of the ovary ovate, orbicular, or cordate, and mostly fringed, their axils almost naked: fruit scaly, never woolly.* — Leiocarpi.

+ *Spines smooth.*

1. **E. Whipplei,** Engelm. & Big. Heads solitary, globose or ovate, middle-sized, with 13 (to 15) compressed and interrupted ribs: of the 7 to 11 outer and 4 inner spines, the ivory-white upper ones are the longest and broadest and recurved or

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twisted ; the lower are shorter, darker, and terete, and the lowest middle one hooked : flowers 1 to $1\frac{1}{4}$ inches long, yellow : few (2 to 5) rounded fringed sepals on the ovary, 10 to 15 oblong ones on the tube : petals about 8 : stigmas 5 to 7, short : seeds large, minutely tuberculated. — Cact. of Pacif. R. Rep. iv. 28, t. 1 ; Bot. Ives Colorado Exp. 12.

On the lower Colorado, on the confines of California, Arizona, and Utah (*Bigelow, Newberry, H. Engelmann*), and to Southern Colorado, *Brandegee.* Heads 3 to 5 inches high ; spines 3 to 20 or 24 lines long, on prominent tubercles, which give the ribs a wavy or interrupted appearance : seeds $1\frac{1}{2}$ to $1\frac{3}{4}$ lines long.

2. **E. polyancistrus,** Engelm. & Big. Heads solitary, middle-sized, ovate to cylindrical, with 13 (to 17) interrupted ribs : outer spines 20 or more, white, the uppermost broader and longer ; central spines 5 to 10, the upper one broadest, longest, recurved, white, the others brown, terete, and mostly hooked : flowers yellow, 2 to $2\frac{1}{2}$ inches long, with about 8 rounded fringed sepals on the ovary : seeds as in the last. — Cact. of Pacif. R. Rep. iv. 29, t. 2, fig. 1, 2.

From the head-waters of the Mohave River (*Bigelow*) to the sage plains of Southwestern Nevada, *Gabb.* Perhaps too near the last, from which it is distinguished by the more numerous spines, many of the inner ones being hooked, the larger flowers, and more numerous sepals and petals. Heads 3 to 10 inches high, 2 to 4 thick ; larger spines of the Mohave form 3 to 5, of the Nevada plant only 1 or 2 inches long.

\+ \+ *Spines, at least the larger ones, transversely ribbed or annulated.*

3. **E. viridescens,** Nutt. Heads solitary, middle-sized, globose or depressed, with about 13 obtuse tuberculated ribs and a woolly depressed summit : spines stout, reddish, straight or recurved, all annulated, about 12 radiating and 4 (to 6) stouter central ones : flowers greenish ($1\frac{1}{2}$ inches long), with numerous (25 or more) roundish denticulate imbricated sepals on the ovary, as many on the tube, and about the same number of oblong obtuse denticulate petals : stigmas 12 to 15, linear : berry pulpy, green, scaly, with numerous small pitted seeds. — Torr. & Gray, Fl. i. 554 ; Engelm. Cact. Mex. Bound. 24, t. 29.

About San Diego, from the sea-beach to the arid hills and ridges inland ; cultivated in Europe under the name of *E. Californicus.* Heads 4 to 7 inches in diameter, 3 to 5 inches high, more rarely globose ; woolly vertical area (the youngest growth, where the spines are not yet developed) an inch wide, surrounded by the numerous flowers.

4. **E. cylindraceus,** Engelm. Heads middle-sized or large, oval or cylindrical, often proliferous at base, with 21 (to 27) obtuse somewhat tuberculate ribs, and a woolly spineless depressed top : reddish spines all stout and annulated, recurved or flexuous, 12 to 18 exterior, the lowest usually hooked, and 4 very stout central ones : yellowish flowers 2 inches long, with 40 to 50 rounded fringed sepals on the ovary, and about 25 fringed petals : stigmas and fruit as in the last. — Cact. Mex. Bound. 25, t. 30. *E. viridescens,* var. (?) β. *cylindraceus,* Engelm. in Am. Jour. Sci. 2 ser. xiv. 338.

Colorado desert (*Palmer, Bischoff*), to the eastern slope of the mountains near San Felipe, *Parry.* Closely allied to the last, from which it is distinguished by its higher growth, more numerous ribs, larger and more numerous spines, and larger flower and fruit. Young plants globose, with fewer ribs ; older ones much higher than thick, 2 or 3 feet high, a foot in diameter, with 20 to nearly 30 ribs ; radial spines 1 or 2, the central 2 inches or over in length ; green berry about an inch thick.

5. **E. Emoryi,** Engelm. Heads solitary, large, globose or oval, with 13 to 20 obtuse tuberculated ribs : on the ovate areolæ 8 or 9 robust reddish spines, angled and annulated and slightly recurved, a stouter and longer one in the centre, turned downward or more or less hooked : flowers large, purple, with numerous (25) reniform ciliate sepals on the ovary and as many spatulate ones on the tube : petals about the same number, lanceolate, laciniate-toothed towards the acuminate tip : stigmas 18 to 20, erect, almost as long as the very robust style. — Emory Rep. 156 ; Cact. Mex. Bound. 23, t. 28.

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Arizona and Sonora to the Mohave region (*Emory*, *Bigelow*, *Schott*), and into Lower California, *Gabb.* Plants 1 or 2 and even 3 feet high, 1 or 2 feet thick; all the spines very stout and strongly cross ribbed, 1½ to 3 inches long; flowers 3 inches long, purplish brown outside; petals red, with yellow margin; seeds much like those of the next species.

6. **E. Wislizeni,** Engelm. Very large, oval, at last cylindrical or often club-shaped, with 21 to 30 compressed crenate ribs: oblong areolæ bearing various spines; in the centre 4 stout cross-ribbed ones, the lower one flattened and curved or hooked; above and below 6 to 10 slightly ribbed, and laterally 10 to 20 long slender often flexuous ones: flowers greenish yellow, 2 to 2½ inches long: ovary and fruit imbricately covered with 30 or 40 to 60 or 100 roundish cordate sepals; inner sepals spatulate, 20 to 30: petals as many, lanceolate, crenulate: style divided to the middle into 12 to 20 stigmas: yellowish berry at last hard and dry; seeds over a line long, reticulated. — Wislizenus Rep. 1848, note 14; Cact. Mex. Bound. 23, t. 25, 26.

From the Rio Grande to the Colorado, northward into Utah and west into California; flowering throughout the summer and autumn. Often 3 and even 4 feet high and 1 or 2 in diameter, with a woolly spineless top; spines 1½ to 2½ inches long, grayish red, the thinner ones whitish. *E. Lecontei*, Engelm., seems to have been founded on weaker plants of this, with the seeds of perhaps No. 4.

* * *Scales of the ovary subulate, often spinescent, copiously woolly in their axils; fruit enveloped in wool.* — Eriocarpi.

7. **E. polycephalus,** Engelm. & Big. Middle-sized or large, globose, at last cylindric, sprouting from the base; ribs 13 to 21, acute: circular areolæ bearing 8 to 12 stout compressed annulated curved reddish gray spines: flowers enveloped in a mass of dense white wool: petals about 30, lance-linear, yellow: stigmas 8 to 11, linear: dry berry full of large angular seeds. — Cact. of Pacif. R. Rep. iv. 31, t. 3, fig. 4 – 6.

Gravelly or stony soil on the Colorado and Mohave rivers, and in the Californian desert (*Bigelow*); flowering in February, fruiting in March. Heads sometimes 20 or 30 from a single base, ½ to 1½ feet high, the larger cylindric ones 2 to 2½ feet high; spines either all radial, or 6 to 8 outer ones surrounding 4 stouter central ones; flowers 1½ inches long; about 100 rigid dark pointed sepals upon the ovary are hidden in the wool, those of the tube similar and about as many; petals about 30, narrow, yellow, just emerging from the wool; seeds 2 lines long, wrinkled and minutely tuberculate.

3. CEREUS, Haworth.

Flowers about as long as wide or elongated. Scales of the ovary distinct, with naked or woolly axils, or almost obsolete and the axils spiny. Berry succulent, covered with spines or scales or almost naked. Seeds black, without albumen. Embryo short and straight or curved or hooked; cotyledons usually contrary to the sides of the seed. — Plants of all sizes, low or climbing or erect, sometimes enormous; spine-bearing areolæ on vertical ribs. Flowers from the older or, at least, fully formed parts of the plant, not from any preformed areola, but bursting through the epidermis just above the bunches of spines; some open only in sunlight, others only at night, others again are not thus influenced. Fruit often edible, sometimes of very large size.

§ 1. *Low and usually cespitose plants, mostly with numerous oval or cylindric heads, short flowers, green stigmas, and spiny fruit: seeds subglobose, covered with confluent tubercles: embryo straight, with very short cotyledons.* — Echinocereus.

1. **C. Engelmanni,** Parry. Heads several from a single base, oval or cylindrical, with 11 to 13 interrupted ribs: radial spines about 13, whitish, often somewhat angled, straight or curved, the lateral ones the longest; central ones 4, longer,

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angular, variously colored: large purple flowers open only in sunlight: ovary and fruit with 25 to 30 spiny areolæ, 15 to 20 upper sepals, and as many lance-oblong petals: stigmas about 12, erect. — Am. Jour. Sci. 2 ser. xiv. 338; Cact. of Pacif. R. Rep. iv. 35, t. 5, fig. 4 – 10.

From the eastern slopes of the Southern Sierra Nevada, at San Felipe, into Arizona and Utah, apparently abundant, *Parry*, *Newberry*, *Palmer*, and others. Heads usually 4 to 6 together, 5 to 10 inches high, 2 or 3 thick; outer spines $\frac{1}{4}$ to $\frac{3}{4}$, inner 1 or 2 inches long; flowers $2\frac{1}{2}$ to 3 inches long and wide, appearing in June.

§ 2. *Prismatic or cylindric, mostly branching: flowers usually longer than wide: stigmas whitish: seeds obovate, usually smooth or pitted: embryo with foliaceous curved cotyledons.* — EUCEREUS.

* *Ovary and fruit spiny.*

2. **C. Emoryi,** Engelm. Stems erect, branching from the base, cylindric, with 16 to 20 ribs, closely set with prominent hemispherical areolæ bearing numerous (30 to 50) thin straight yellow spines $\frac{1}{4}$ to 1 or $1\frac{3}{4}$ inches long; the 3 to 6 inner ones longer and deflexed: flowers short, greenish yellow, crowded on one side of the top of the stems: ovary with few short spines, which become formidable upon the subglobose fruit. — Am. Jour. Sci. l. c.; Cact. Mex. Bound. 40, t. 60, fig. 1–4.

On the gravelly mesas near the sea-shore at San Diego (*Parry*, *Agassiz*, *Hitchcock*), and quite abundant on rocky hills from Los Angeles to the Salinas Valley (*Brewer*), and into the Peninsula to Rosario, *Gabb*. Stems 2 to 4 feet high, $1\frac{1}{2}$ to 2 inches thick, often from a prostrate rooting base, and forming dense thickets; areolæ 2 lines wide and 3 or 4 lines apart, densely covered with the thin sharp and very brittle spines; flowers usually on one side only, like those of § *Pilocereus*, $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long and a little less wide; fruit about an inch long; seeds over a line long, shining, minutely tuberculate.

* * *Ovary and fruit scaly.*

C. GIGANTEUS, Engelm., 15 to 30 or even 40 feet high, very stout, with few erect branches towards the upper part, cream-white short-tubed flowers, and large oval edible fruit, which at maturity bursts irregularly, and

C. THURBERI, Engelm., 10 to 15 feet high, more slender, with many equally high ascending branches from the base, similar flowers, and larger globose delicious fruits, are found in the adjoining territories of Arizona and Lower California, and may be looked for in this State.

§ 3. *Tall, cylindric, mostly unbranched; upper flower-bearing portion with more crowded areolæ and longer denser thinner bristly or hairy spines: flowers short: seeds as in the last.* — PILOCEREUS.

C. SCHOTTII, Engelm., 4 to 10 feet high, the lower part 5-angled, with distant areolæ and few very short and stout spines; the upper flowering portion deeply 5-ribbed, with close-set areolæ bearing numerous setaceous spines, almost hiding the small flowers and small berries, — from the same localities as the last two species, — may also be found in Southern California.

4. OPUNTIA, Tourn., Miller.

Tube of the flower very short, cup-shaped. Petals spreading or rarely erect. Ovary with bristle-bearing areolæ in the axils of small terete deciduous sepals. Berry succulent or sometimes dry, marked with bristly or spiny areolæ, truncate with a wide umbilicus. Seeds large, white, compressed, with the embryo coiled around the albumen: cotyledons large, foliaceous. — Articulated much-branched plants, of various shapes, low and prostrate, or erect and shrub-like; young branches with small terete subulate early deciduous leaves, and in their axils an areola with numerous short easily detached bristles and, usually, stouter spines, all barbed. Flowers on the joints of the previous year, on the same areolæ with the spines, mostly large, open only in sunlight. Fruit often edible, often large.

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§ 1. *Joints compressed: rhaphe forming a prominent bony margin around the seed: embryo completing a little more than one circle around the scanty albumen; cotyledons contrary to the sides of the seed.* — PLATOPUNTIA.

* *Fruit pulpy.*

1. **O. Engelmanni,** Salm. Bushy, erect-spreading, much branched: obovate joints ½ to 1 foot long, sparsely armed with bundles of 1 to 3 or sometimes even 5 spines, the stouter ones angled, yellow, sometimes with a red-brown base; old trunks losing their spines: flowers yellow, about 3 inches wide: petals broadly obovate, truncate: the purple oval juicy berry about 2 inches long, with a large flat umbilicus, and with 20 to 25 brown-woolly and slightly bristly areolæ. — Salm. Cact. cult. 1849, 235; Engelm. Cact. Mex. Bound. 47, t. 75, fig. 1 – 4.

Var. β. **occidentalis,** Engelm. Spines fewer, stouter, farther apart: seeds larger. — *O. occidentalis,* Engelm. & Big. in Cact. of Pacif. R. Rep. iv. 38, t. 7.

Var. (?) γ. **littoralis,** Engelm. Joints often larger, 1 to 1½ feet long: bunches of longer and more slender spines closer together: fruit similar, but with 40 to 50 areolæ: seeds smaller.

Apparently a polymorphous species, extending from Southern Texas to the Pacific, which will probably be identified with some older Mexican species when these plants come to be better understood. The two forms of California are easily distinguished by the characters given above. The var. *occidentalis* has been found on the western slope of the mountains east of Los Angeles and southward to San Isabel, etc., at an elevation of 1,000 to 2,000 feet, *Parry, Schott.* The areolæ of the joints are 1½ to 2 inches apart; spines ½ to 1¼ inches long; flowers 3 to 3½ inches wide, yellow with orange centre; fruit often 1½ inches thick; seeds 2½ to 2¾ lines wide. The second form, var. *littoralis,* extends on the coast from Santa Barbara and the islands in its gulf (*O. Tittmann*) to San Diego, and southward, *G. N. Hitchcock.* Seeds 2 to 2½ lines in diameter. — The limits of these species are difficult to circumscribe, especially because complete specimens are so hard to preserve and extensive observations in the field have not yet been made. Of the three following no more is known now than there was twenty years ago.

2. **O. chlorotica,** Engelm. & Big. Erect, bushy; old trunks covered with large areolæ which, retaining their vitality, constantly produce new spines; joints large, pale green, orbicular-obovate, with close-set areolæ, each bearing 1 to 5 slender deflexed yellow spines: flowers yellow, 2½ to 3 inches wide, with spatulate petals. — Cact. of Pacif. R. Rep. iv. 38, t. 6, fig. 1 – 3.

From Mohave Creek eastward to Bill Williams Mountain in Arizona (*Bigelow*); 4, 5, or even 7 feet high, readily recognized by the very spiny trunk and very pale broad joints ¾ to 1 foot long.

3. **O. angustata,** Engelm. & Big. Prostrate or ascending, with obovate elongated joints: large oblong areolæ sparse, bearing brown bristles and few (1 to 3) deflexed spines: fruit rather small, deeply umbilicate, with few large seeds. — Cact. l. c. 39, t. 7, fig. 3, 4.

From Cajon Pass eastward into Arizona, *Bigelow.* Joints 10 inches long or more, not half as wide above, narrowed downward; berry 1½ inches long, narrow; seeds 3 lines wide.

4. **O. Mohavensis,** Engelm. & Big. Prostrate, with large nearly orbicular joints, and more numerous (2 to 6) stout and long often curved brown spines. — Cact. l. c. 40, t. 9, fig. 6 – 8.

On Mohave Creek, *Bigelow.* A doubtful form, of which flowers and fruit are unknown. It seems to approach *O. phœacantha* of New Mexico, and perhaps even the stouter western forms of *O. Rafinesquii.* It is indicated here merely for the attention of future explorers.

O. TUNA and O. FICUS-INDICA, Mill., are probably both naturalized about the old missions; one with stout yellow spines and insipid fruit, the last with weaker whitish spines, fruit delicious.

+ *Fruit dry.*

++ *Joints and fruit spiny.*

5. **O. rutila,** Nutt. Prostrate, with thick obovate or elongated joints: areole close, armed with numerous slender reddish or gray flexible spines: large flowers purple: stigmas green: berry deeply umbilicate, with large flat broadly margined

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ivory-white seeds. — Nutt. in Torr. & Gray, Fl. i. 155. *O. erinacea*, Engelm. & Big. Cact. l. c. 47, t. 13, fig. 8 – 11.

From the Mohave region (*Bigelow*) to Southern Utah (*Palmer*), and up the Colorado Valley, *Nuttall*. This plant seems to be Nuttall's long-lost *O. rutila*, and also *O. erinacea* of the Mohave, the flower of which is unknown. Joints 2 to 4 inches long, 1½ to 3 wide, and often, especially in young plants, thick and almost terete, thus approaching to *O. fragilis:* seeds 3 lines wide.

÷ ÷ *Joints and fruit pubescent, without spines.*

6. **O. basilaris,** Engelm. & Big. Low, with obovate often retuse or fan-shaped joints, branching only from the base : areolæ very close, densely covered with short brown bristles : flowers large, rose-purple : fruit subglobose, with deep umbilicus, and rather few large and thick seeds. — Cact. l. c. 43, t. 13, fig. 1 – 5.

From the eastern base of the mountains near San Felipe through the desert and into Arizona, *Bigelow, Newberry, Palmer,* &c. Joints 5 to 8 inches long, and often as wide near the top ; distinct from all other species of this region in its mode of growth, its pubescence, absence of spines proper, and its very large seeds (3½ to 5 lines wide), which have a thicker but less prominent rim than any other of this section.

§ 2. *Joints cylindrical, more or less tuberculated : rhaphe usually not prominent, therefore seed not margined : embryo forming less than one circle around the more copious albùmen ; cotyledons inconstant, contrary, oblique, or parallel to the sides of the seed.* — CYLINDROPUNTIA.

* *Low plants with clavate joints, without a firm ligneous skeleton : larger spines angular-compressed, without sheaths : berries dry and very bristly.*

7. **O. Emoryi,** Engelm. Joints long, clavate-cylindrical, with linear-oblong and very prominent tubercles : spines numerous (15 to 30) in the upper bundles, the 5 to 9 inner ones stouter, angular-compressed : seeds large, irregular, the rhaphe indistinct. — Cact. Mex. Bound. 53, t. 70, 71.

Colorado desert from San Felipe (*Parry, Bigelow*) eastward, and into Arizona (*Schott, Palmer*) and the Peninsula, *Gabb.* Joints 5 to 9 inches long, 1 to 1½ thick ; tubercles 1 to 1½ inches long ; fruit 2 to 2½ inches long ; seeds 2½ to 3 lines wide.

8. **O. Parryi,** Engelm. Joints short, ovate-clavate with oblong tubercles : spines 12 to 20, reddish gray, the 3 or 4 inner ones stouter, triangular-compressed : seeds smaller, regularly circular, with a broad and distinct rhaphe. — Am. Jour. Sci. 2 ser. xiv. 339 ; Cact. of Pacif. R. Rep. iv. 48, t. 22, fig. 4 – 7.

Gravelly plains near the Mohave River (*Bigelow*), and through the desert to the base of the mountains, *Parry.* Joints 3 or 4 inches long, 1¼ thick ; tubercles about ¾ inch long.

9. **O. pulchella,** Engelm. Joints smaller, slender : tubercles small : spines 15 to 25, of which usually one only is stouter, flattened, deflexed : flowers purple : ovary and fruit with long flexuous bristles : seeds small, with a broad rhaphe. — Trans. Acad. St. Louis, ii. 201 ; Bot. King Exp. 119 ; fig. in Simpson Rep. ined.

Sandy deserts of Southeastern California and Nevada, and among the sage-bushes of the mountains, *H. Engelmann, W. Gabb, Watson.* The prettiest and smallest of the clavate *Opuntiæ,* the only one with purple flowers ; joints rarely longer than 1 or 2 inches ; flowers 1¼ to 1½ inches wide ; seeds 2 lines in diameter.

* * *More or less erect, much branched : joints cylindric : ligneous skeleton solid or tubular and reticulated : larger spines terete, coated with a loose sheath.*

÷ *Fruit dry and spiny : flowers yellow.*

10. **O. tessellata,** Engelm. Much branched, bushy, from a stout ligneous trunk : joints slender, covered with angular flattened ashy-gray tubercles, bearing above long single loosely sheathed spines : flowers small, yellow : small oval fruit covered with long brown bristles : seeds with a very broad flat rhaphe. — Cact. of Pacif. R. Rep. iv. 52, t. 21.

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Throughout the Californian desert from the mountains to the Colorado, and into Arizona. Bushes 4 to 6 feet high; trunk solid, sometimes 2 inches in diameter; joints only ¼ or ⅓ inch thick; spines an inch or two long; flowers 6 to 9 lines wide; fruit 9 lines long; seeds 2 lines wide.

11. **O. echinocarpa,** Engelm. & Big. A low much-branched and spreading shrub: joints ovate-clavate, densely covered with numerous spines (3 or 4 stouter, 8 to 16 weaker ones in a bunch), which are loosely coated with a whitish glistening sheath: flowers pale greenish yellow, about 1½ inches wide: fruit depressed, deeply umbilicate, very spiny: seeds few (2 lines wide), with a broad flat rhaphe. — Cact. l. c. 51, t. 18, fig. 5 – 10; Bot. Ives Colorado Exp. 14.

Common in the desert from the mountains to the Colorado River, and into Arizona. Usually only 1 to 1½ feet high, very showy from its conspicuous shining spines, an inch or two long.

12. **O. serpentina,** Engelm. A large straggling densely branched shrub: joints elongated, covered with oblong prominent tubercles, which bear bunches of numerous short spines, very soon losing their inconspicuous sheaths: flowers clustered, greenish yellow, reddish externally: petals spatulate, obtuse: stigmas 8, whitish: fruit broadly oval, deeply umbilicate: seeds thick, irregular, with a narrow rhaphe. — Am. Jour. Sci. 2 ser. xiv. 338.

Common near the coast, at San Diego, *Parry, Hitchcock.* Bushes 3 to 5 feet high; spines 8 to 15 in a bunch, 3 to 6 lines long; flowers 1½ inches wide; fruit about 9 lines long.

++ *Fruit green, fleshy, and without spines: flowers red.*

13. **O. prolifera,** Engelm. An arborescent shrub with elongated joints, covered with oblong obtuse tubercles, which bear 3 to 6 or 8 spines, obscurely sheathed: flowers densely clustered at the ends of the branches, small, ~~brick-red~~ purple: fruit clavate, obovate, or subglobose, strongly tubercled, deeply umbilicate, almost always sterile and often proliferous: seeds large, regular, with a broad prominent rhaphe. — Am. Jour. Sci. l. c.

San Diego (*Parry, Schott, Agassiz*), up the coast to San Buenaventura, and southward into the Peninsula, *Gabb.* Larger than the last, with stouter more strongly tubercled joints, and fewer and shorter spines, and easily distinguished from it in flower and fruit: longest spines 1 to 1½ inches long; flowers 1½ inches wide; seeds 3 lines in diameter, with a more prominent and broader rhaphe than its allies.

Several other *Opuntiæ,* belonging to this last section, all with red flowers and fleshy fruit, are found in Western Arizona and may also be expected on the western side of the Colorado. They are all erect much-branched bushes, covered with shining sheathed spines. The more northern

O. BIGELOVII, Engelm., has short tubercles.

O. FULGENS, Engelm. & Big., and O. MAMILLATA, Schott, both south of the Gila (perhaps forms of a single species), have very prominent tubercles, and small curiously irregular seeds 1½ to 2 lines long, with a linear rhaphe.

O. LEPTOCAULIS, DC., including *O. frutescens,* Engelm., *O. vaginata,* Engelm., and several other synonyms, is the slenderest of all *Opuntiæ,* with long branches scarcely thicker than a goose-quill, small yellow flowers, and a small pulpy scarlet fruit; common throughout all Northern Mexico, ranging into Texas, New Mexico, and Western Arizona, and may also be found west of the Colorado River.

ORDER XLIV. FICOIDEÆ.

A miscellaneous group, chiefly of fleshy or succulent plants, with mostly opposite leaves and no stipules; differing from *Caryophyllaceæ* and *Portulacaceæ* by having distinct partitions to the ovary and capsule (which are therefore 2 – many-celled); the petals and stamens sometimes numerous in the manner of *Cactaceæ* (but the former wanting in most of the genera); agreeing with all these orders in the campylotropous or amphitropous seeds; the slender embryo curved partly or completely round a mealy albumen.

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It is mainly a tropical and subtropical family, of the Old World. Our Pacific Coast has only two indigenous representatives, both insignificant, and as many naturalized ones, which appear as if wild on the sea-shore.

* Calyx-tube adnate to the ovary : petals and stamens very numerous.

1. **Mesembryanthemum.** Capsule 5-valved or more. Very fleshy.

* * Ovary free : petals none : stamens few or many.

2. **Sesuvium.** Calyx-lobes 5, petaloid. Stamens 5 to 60. Capsule circumscissile. Succulent.
3. **Mollugo.** Sepals 5. Stamens 3 or 5. Capsule 3-valved. Not succulent.

1. MESEMBRYANTHEMUM, Linn. Ice-Plant. Fig-Marygold.

Calyx-tube adnate to the ovary; the lobes usually 5, unequal, foliaceous. Petals very numerous, linear. Stamens innumerable, with slender filaments, inserted with the petals on the tube of the calyx. Styles 4 to 20, usually 5. Capsule 4 – 20-celled, dehiscing in a star-like manner at the depressed summit. Seeds minute, very numerous. — Fleshy herbs or shrubs, rarely annual; leaves mostly opposite, without stipules; flowers mostly showy, terminal and in the forks of the branches.

A genus of about 300 species, principally S. African, but a few found in the Mediterranean region, Western S. America, and Australia. The Californian species are probably introduced.

1. **M. æquilaterale,** Haworth. Perennial, with stout prostrate or ascending stems and short ascending flowering branches : leaves very fleshy, opposite and clasping, linear, acutely triangular, 1 to 3 inches long, smooth : flowers solitary, red, pedicellate or nearly sessile, about $1\frac{1}{2}$ inches in diameter : calyx-tube turbinate, half an inch long or more, angled or terete; the larger lobes often as long : stigmas 6 to 10. — DC. Prod. iii. 429.

On the sea-shore and in saline soils from San Diego to Punta de los Reyes. Also in Chili and abundant in Australia and Tasmania, and very similar to *M. acinaciforme* of S. Africa. Fruit edible and pleasant, and the flowers very fragrant.

2. **M. crystallinum,** Linn. Annual or biennial, diffusely procumbent, covered with large white glistening papillæ : leaves flat, fleshy, often alternate on the branches, clasping, ovate or spatulate, undulate : flowers axillary, nearly sessile, white or rose-colored : calyx-tube campanulate, terete, 4 or 5 lines long; lobes ovate, retuse or acute : stigmas 5. — DC. Prodr. iii. 448.

San Diego (*Cleveland*); Santa Cruz Island (*Rothrock*); collected also by *Fremont.* Apparently identical with S. African specimens.

2. SESUVIUM, Linn. Sea Purslane.

Calyx-tube turbinate, free from the ovary; the lobes 5, oblong-lanceolate, apiculate on the back near the top, membranously margined, often colored within. Petals none. Stamens 5, alternate with the lobes, or many, inserted at the top of the calyx-tube. Styles 3 to 5. Capsule ovate-oblong, membranaceous, 3 – 5-celled, circumscissile at the middle, many-seeded. — Succulent smooth branching mostly prostrate herbs, sometimes woody at base; leaves opposite, linear to spatulate, entire, without stipules or united by a stipule-like membrane; flowers axillary and terminal, solitary or clustered.

About 4 species are known, frequenting the sea-coast and saline localities through the tropics and warmer regions of the globe.

1. **S. Portulacastrum,** Linn. Perennial : stems prostrate or ascending, herbaceous, often a foot long or more : leaves linear- to oblong-oblanceolate, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, acute or obtuse : flowers sessile or pedicellate : calyx 3 to 5 lines long;

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the lobes more or less purple: stamens many. — Rohrbach in Mart. Fl. Bras. xiv^2. 310, t. 70.

A very variable species, widely distributed around the globe. It has been collected near Fort Mohave (*Cooper*), and is frequent in saline or alkaline valleys through the interior from N. Nevada to Colorado and New Mexico, often with much broader leaves than is usual in the sea-coast forms.

3. **MOLLUGO,** Linn. CARPET-WEED.

Calyx 5-cleft nearly to the base; the lobes herbaceous, membranously margined. Petals none. Stamens 3 or 5, rarely twice as many, hypogynous. Styles 3. Capsule free, thin-membranaceous, 3 – 5-celled, loculicidally 3 – 5-valved, the partitions breaking away from the persistent central placenta. Seeds several in each cell, longitudinally sulcate on the back. — Annuals, low and much branched, glabrous, not succulent; leaves linear to obovate-spatulate, entire, opposite and apparently verticillate; stipules obsolete; flowers mostly on long pedicels and axillary.

About a dozen species in the warmer regions of the globe. The following is the only one indigenous to N. America.

1. **M. verticillata,** Linn. Prostrate, covering the ground, slender: leaves spatulate to linear-oblanceolate, an inch long or less: pedicels umbellately fascicled at the nodes, slender, 2 or 3 lines long: sepals and oblong-ovoid capsule about 1½ lines long: seeds reniform, shining. — Rohrbach, l. c. 240, t. 55.

On light sandy soils from the Columbia River southward; at Eagle Creek, near Shasta, and at McCumber's Flat (*Brewer, Newberry*); from Arizona to Colorado and New Mexico, and frequent in the Atlantic States as a weed in cultivated grounds: thence southward to the W. Indies and Brazil.

ORDER XLV. **UMBELLIFERÆ.**

Herbs with small flowers in umbels (sometimes contracted into heads), five epigynous stamens and petals, and two styles; the calyx adnate to the 2-celled ovary, which contains a solitary ovule suspended from the summit of each cell; and the fruit splitting into a pair of dry seed-like indehiscent carpels. Seed with a minute embryo in hard albumen. Petals mostly valvate in the bud. Stem commonly hollow. Leaves mainly alternate, mostly compound, often decompound: the petiole expanded or sheathing at base. Umbels usually themselves umbellate, forming a compound umbel: this is then usually called the umbel, and the partial umbels are called *umbellets.* The bracts under the general umbel, when present, form an *involucre;* those under the umbellets, an *involucel.* The enlarged base of the styles, or the common base of the two, takes the name of *stylopodium:* it is often surrounded by or confluent with an epigynous disk. Each of the two carpels is commonly traversed by 5 longitudinal ribs: in the intervals between them are usually lodged one or more longitudinal canals containing aromatic oil, the *vittæ* or oil-tubes. The face by which the two carpels cohere is the *commissure:* a slender prolongation of the axis between them is the *carpophore:* it is apt to split into two branches, a carpel suspended for some time from the tip of each.

A family of almost 200 genera and much above a thousand species, dispersed over all parts of the world, but abundant only in warm, temperate, or cooler regions. Many are poisonous (Hemlock, Water-Hemlock, &c.): others afford esculent roots (Parsnip, Carrot), or their herbage may be eaten after blanching (Celery); several are innocent and aromatic (Dill, Fennel), at least the fruits (Caraway, Anise, &c.).

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The genera are difficult, as they have to rest mainly on the fruit and seed: these are best examined in transverse slices. The whole order is divided into numerous tribes. These, being somewhat recondite, are here dispensed with.

I. Umbels simple, or irregularly or imperfectly compound, the flowers sessile or slightly pedicellate. Oil-tubes none or obscure.

* Leaves simple, not strongly lobed nor toothed: umbels simple or proliferous: flowers white, without bracts: oil-tubes none.

1. **Hydrocotyle.** Leaves peltate or orbicular. Fruit rounded, laterally compressed, smooth: ribs filiform. Creeping, aquatic or subaquatic.
2. **Bowlesia.** Leaves reniform, opposite! Fruit ovate, turgid and ribless, pubescent.

* * Leaves spinosely toothed, or palmately lobed or pinnatifid: oil-tubes obscure.

3. **Eryngium.** Leaves rigid, spinosely toothed. Flowers perfect, bracteate, sessile in dense heads, bluish. Fruit covered with hyaline scales.
4. **Sanicula.** Leaves lobed and incised. Flowers polygamous, in irregularly compound umbels, mostly yellow. Fruit covered with hooked prickles or tubercles.

II. Umbels regularly compound. Fruit without prominent secondary ribs and not furnished with hooked or barbed prickles. Oil-tubes rarely wanting.

* Fruit more or less compressed laterally, broadly ovate or subglobose to elliptic-oblong, not broadly winged.

+ Seed terete, with involute margins: oil-tubes conspicuous: carpophore entire: flowers yellow.

5. **Deweya.** Fruit oblong or nearly orbicular; ribs filiform or prominent: oil-tubes 2 or 3 in the intervals.

+ + Seed deeply sulcate on the face: oil-tubes wanting: carpophore 2-parted: flowers white.

6. **Conium.** Fruit broadly ovate, with prominent equal obtuse ribs.

+ + + Seed nearly terete or but slightly concave on the face: flowers white.

++ Fruit small, not prominently ribbed: oil-tubes solitary: stylopodium depressed: umbels naked, sessile or nearly so.

7. **Apium.** Fruit broadly ovate: seed not concave: carpophore entire. Biennial.
8. **Apiastrum.** Fruit cordate: seed concave and longitudinally incurved: carpophore 2-parted. Annual.

++ ++ Fruit not prominently ribbed: stylopodium more or less prominent: carpophore bifid or 2-parted.

9. **Carum.** Fruit ovate or oblong: ribs filiform: oil-tubes solitary. Involucre and involucels usually present. Leaflets linear, entire.
10. **Pimpinella.** Fruit ovate, with a broad commissure: ribs slightly prominent: oil-tubes numerous. Umbels nearly naked. Leaflets cuneate-ovate, pinnatifid.
11. **Berula.** Fruit nearly globose, emarginate at base, with thickened epicarp: oil-tubes numerous and contiguous. Involucre and involucels present. Leaflets ovate-oblong to linear, laciniately toothed.

++ ++ ++ Fruit with prominent corky wings, didymous: stylopodium depressed: carpophore 2-parted. Stout perennials, with involucels and often involucres also.

12. **Cicuta.** Fruit broadly ovate, with thick obtuse wings: oil-tubes solitary.
13. **Sium.** Fruit oblong or ovate: ribs wing-like: oil-tubes 2 or 3 in the intervals.

* * Fruit somewhat compressed laterally, linear-oblong, with broad commissure, not winged; seed sulcate or reniform in section; carpophore 2-parted, persistent: flowers white.

14. **Osmorrhiza.** Fruit narrowly attenuate at base, hispid on the acutish angles: oil-tubes very obscure: seed sulcate on the face or somewhat involute. Umbels nearly naked. Leaflets ovate, cleft and toothed.
15. **Glycosma.** Similar; fruit not attenuate at base, very rarely hispid: seed broadly sulcate.
16. **Podosciadium.** Fruit not attenuate at base, glabrous: ribs filiform: oil-tubes solitary or in pairs: seed reniform in section and longitudinally ridged on the face. Involucre and involucels present. Leaflets linear.

* * * Fruit not compressed, or more or less compressed dorsally, oblong to orbicular.

+ Fruit not compressed: flowers white.

17. **Œnanthe.** Fruit oblong to globose: ribs corky and rounded, with very narrow intervals and solitary oil-tubes.

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+ + Fruit somewhat compressed dorsally ; the dorsal ribs rather narrowly winged ; the lateral wings broader, distinct : stylopodium somewhat prominent : seed sulcate or concave : tall herbs, with white flowers.

18. **Ligusticum.** Dorsal ribs narrowly winged : oil-tubes several in the intervals, obscure : seed reniform in section.
19. **Selinum.** Dorsal wings broader : oil-tubes solitary : seed nearly flat on the face.

+ + + Fruit much flattened dorsally.

++ Lateral wings broad, distinct, the dorsal more or less prominent : seed concave on the face or nearly flat.

20. **Angelica.** Dorsal wings narrower than the lateral : oil-tubes solitary. Stout herbs, with white flowers and naked or nearly naked umbels.
21. **Cymopterus.** Dorsal wings as broad as the lateral ones : oil-tubes one to several in the intervals. Low perennial herbs ; flowers yellow or white ; involucres present.

++ ++ Lateral wings coherent till maturity ; dorsal ribs filiform : seed nearly flat on the face.

22. **Peucedanum.** Lateral wings thin : oil-tubes as long as the fruit. Involucre none. Low perennials ; flowers yellow or white, not radiate.
23. **Heracleum.** Lateral wings thin : oil-tubes solitary, clavate, not reaching the base of the fruit. Stout pubescent perennials, with white, often radiate flowers.
24. **Ferula.** Lateral wings corky, as thick as the fruit : oil-tubes numerous, mostly obscure.

III. Umbels regularly compound. Secondary ribs most prominent, armed with barbed or hooked prickles : oil-tubes solitary under the wings or ribs, conspicuous. Hispid herbs, with white flowers.

25. **Daucus.** Seed flat on the face. Biennial or annual.
26. **Caucalis.** Seed furrowed on the face or involute. Annuals.

1. HYDROCOTYLE, Tourn. Marsh Pennywort.

Calyx-teeth obsolete. Petals slightly concave, valvate. Fruit flattened laterally, suborbicular, acutely margined, and with 2 or 3 more or less prominent nerve-like ribs on each side ; oil-tubes none ; carpels not separating. — Smooth herbaceous perennials, growing in or near water, with slender creeping stems ; leaves orbicular-peltate or reniform, with scale-like stipules ; flowers inconspicuous, appearing through the summer, the umbels simple or proliferous one above the other, on slender peduncles.

A genus widely dispersed over the globe, of about 70 species, the larger number belonging to the southern hemisphere ; sparingly represented in the United States.

1. **H. prolifera,** Kellogg. Leaves peltate, emarginate at base, simply crenate, on petioles 1 to 3 inches long : peduncles about equalling or exceeding the leaves : whorls 1 to 4, about 8-flowered (12–20-flowered, *Kellogg*), with numerous bractlets, the pedicels a line or two long (3 to 6 lines, *Kellogg*) : fruit a line broad, slightly emarginate at base ; ribs two on each side, prominent ; commissure narrow. — Proc. Calif. Acad. i. 15.

A slender species, growing about San Francisco and elsewhere, first collected by Chamisso ; collected also by *Coulter* in "Sonora Alta," and by others in Mexico. It has been referred to *H. vulgaris* of the Old World, from which it is distinguished by its much longer peduncles and pedicels, the fruit in *H. vulgaris* being nearly sessile.

2. **H. ranunculoides,** Linn. fil. Stouter, usually floating : leaves not peltate, orbicular, with 3 to 7 crenate lobes, on petioles 2 to 9 inches long : peduncles much shorter than the petioles, $\frac{1}{2}$ to 3 inches long, reflexed in fruit : flowers 5 to 10 in a capitate umbel : fruit 1 to $1\frac{1}{2}$ lines broad, with thickened scarcely angled margins, rather obscurely 3-nerved on each side, longer than the pedicels.

About San Francisco ; San Diego Co. (*Palmer*) ; and probably elsewhere. Common also in the Atlantic States, and from Florida westward through Mexico.

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2. BOWLESIA, Ruiz & Pavon.

Calyx-teeth rather prominent. Petals elliptical, obtusish. Fruit broadly ovate in outline, with a narrow commissure, turgid, becoming depressed on the back, without ribs or oil-tubes. Seed flat on the face, slightly hollowed on the back, not filling the calyx. — Slender herbs, with scattered stellate pubescence; leaves opposite, simple, with scarious and lacerate stipules; flowers white, minute, in simple few-flowered umbels on axillary peduncles.

A dozen species, chiefly South American, one ranging northward to Mexico, Arizona, and California.

1. **B. lobata**, Ruiz & Pavon. Annual, weak and slender, thinly pubescent, the stems dichotomously branched, a foot or two long: leaves thin, reniform to cordate, $\frac{1}{2}$ to $1\frac{1}{2}$ inches broad, shorter than the slender petioles, deeply 5-lobed, the acutish lobes entire or 1 – 2-toothed: peduncles much shorter than the petioles; the umbels 1 – 4-flowered: fruit a line long, sessile or nearly so, pubescent, the inflated calyx not adherent to the carpels, which are at first but partially occupied by the seed. — Fl. Peruv. iii. 28, t. 251; Torr. & Gray, Fl. i. 601.

In damp shady places, from the Sacramento Valley southward, rather rare. The species doubtless includes *B. tenera*, Sprengel.

3. ERYNGIUM, Tourn. Button Snakeroot.

Calyx-teeth manifest, rigid and persistent. Fruit ovoid or obovoid, scarcely compressed, covered with hyaline scales or vesicles; the ribs obsolete, and oil-tubes (in our species) wanting; carpels and seeds semi-terete. — Herbs, chiefly perennial; leaves rigid, coriaceous, spinosely toothed or divided; flowers white or blue, sessile in dense heads, bracteate, the outer bracts forming an involucre.

A genus of 100 or more species, of the warm and temperate regions of the globe. The 15 to 18 American species are mostly confined to the Southern Atlantic and Gulf States.

1. **E. petiolatum**, Hook. Erect, 1 to 5 feet high, dichotomously branched above, glaucous: radical leaves oblanceolate, spinosely and unequally serrate, attenuate into an elongated fistulous petiole, the cauline mostly sessile: heads globose, half an inch in diameter, peduncled; bracts linear-lanceolate, spinosely tipped, at least the outer ones much exceeding the bluish flowers: calyx-teeth a line long, exceeding the fruit, which is covered with subulate at length rigid scales. — Fl. i. 250; Torrey, Bot. Wilkes Exp. 315. *E. articulatum*, Hook. in Lond. Jour. Bot. vi. 232.

Var. **armatum**, Watson. Bracts broader, entire, all similar and much exceeding the flowers, scarcely dilated at base, rigid and with a thickened margin: style shorter than the calyx: usually less glaucous.

In marshes from San Diego to the Columbia; or in drier places, a dwarf state but 2 or 3 inches high. The submerged leaves consist only of the terete jointed petiole without lamina. The usual form has the bracts more or less toothed, the inner ones but little exceeding the flowers or rarely as long as the outer ones, the styles exceeding the calyx-teeth. The variety is mentioned by Dr. Torrey, in Bot. Wilkes Exp. 315, as perhaps distinct. It has been collected from Monterey to Humboldt County, *Brewer*, *Samuels*, *Kellogg*, &c.

4. SANICULA, Tourn. Sanicle.

Calyx-teeth somewhat foliaceous, persistent. Fruit subglobose or obovoid, densely covered with hooked prickles or tuberculate; ribs obsolete; oil-tubes numerous. Seed hemispherical. — Smooth perennials, with nearly naked stems; leaves palmately divided, the lobes more or less pinnatifid or incised; flowers unisexual,

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in irregularly compound few-rayed umbels, involucrate with sessile leafy usually toothed bracts, the bracts of the involucels small and entire.

A genus of a few scattered species, more than half of them native of North America, and of these only two are confined to the region east of the Rocky Mountains. The Californian species are chiefly limited to the Coast Ranges and are peculiar in their habit, small fruit, &c.

* *Leaves palmately divided, the lobes toothed, or lacerate, or pinnatifid with decurrent segments: rootstocks thickened.*

+ *Mature fruit shortly pedicellate: flowers yellow.*

1. **S. arctopoides,** Hook. & Arn. Stems very short, with several divergent scape-like branches, often much exceeding the leaves (3 to 6 inches long), each bearing an umbel of 1 to 3 elongated rays: leaves deeply 3-lobed, the cuneate divisions once or twice laciniately cleft, with lanceolate acute spreading segments: involucre of 1 or 2 similar leaflets: heads large, 3 to 6 lines in diameter, with conspicuous involucels of 8 to 10 narrowly oblanceolate mostly entire bracts: fruit shortly pedicellate, $1\frac{1}{2}$ lines long, naked at base, strongly armed above. — Bot. Beechey, 141; Hook. Fl. i. 258, t. 91.

About San Francisco and eastward in the Sacramento Valley, in the plains and on dry hillsides. Strongly marked by its low scape-like branches, large involucels, and laciniately lobed leaves; plant yellowish green. The figure in Hook. Fl. represents the species poorly, and but for the large solitary head might be supposed to be from a low form of *S. laciniata.*

2. **S. Menziesii,** Hook. & Arn. Stem solitary, erect, 1 to $2\frac{1}{2}$ feet high, branching: leaves rounded-cordate, 2 or 3 inches broad, very deeply 3–5-lobed; the broad lobes sharply toothed or somewhat cleft and the teeth tipped with slender bristles; upper leaves more narrowly lobed and laciniately toothed: umbel of 3 or 4 slender rays; involucre often small, of 2 or 3 narrow leaflets, the involucels of 6 to 8 lanceolate entire bracts a line or two long: sterile flowers nearly sessile: fruit 4 to 8 in each head, becoming distinctly pedicellate and divergent, obovate, a line long or more, covered with hooked prickles. — Bot. Beechey, 142; Hook. Fl. i. 258, t. 90.

In shaded woods from Santa Clara County to the British boundary.

+ + *Fruit sessile.*

3. **S. Nevadensis,** Watson. Stem very short, the peduncles mostly from the base, 1 to 6 inches long: leaves ternate, the divisions oblong-ovate, 3–5-lobed; the segments lobed or toothed: involucre pinnatifid and toothed, a half to an inch long: rays about 5, sometimes branched, 2 to 5 lines long in flower, becoming $\frac{1}{2}$ to $1\frac{1}{2}$ inches long; involucels somewhat one-sided, of several oblong acute bracts more or less united at base: flowers yellow, the sterile equalling the pedicels: fruit covered with stout hooked prickles. — Proc. Am. Acad. xi. 139.

Indian Valley, Plumas County, *Mrs. M. E. P. Ames,* 1874; *Lemmon.*

4. **S. laciniata,** Hook. & Arn. With the habit of *S. Menziesii:* leaves cordate or triangular, 3-parted, the divisions laciniately 1–2-pinnatifid and the segments laciniately toothed; the teeth spinosely pointed: flowers yellow: mature heads small, globose; the numerous fruit naked at base, hooked-bristly above. — Bot. Beechey, 347. *S. nudicaulis,* Hook. & Arn. l. c.

From San Diego to Humboldt County. A form is collected at San Diego and on the Buenaventura with larger heads of flowers and the divisions of the leaves more oblong; perhaps distinct, but the fruit is unknown.

5. **S. bipinnatifida,** Dougl. Erect, a foot high or less, with usually a pair of opposite leaves at base and 1 to 3 leaves above: leaves long-petioled, triangular to oblong in outline, 2 or 3 inches long, pinnately 3–5-lobed; the segments distant, incisely toothed or lobed, decurrent on the toothed rachis; teeth spinose-pointed or only acute: umbel with usually 3 or 4 elongated rays, the cleft involucre lateral:

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